

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

Ag 847Mw
Cap. 2

U. S. DEPT. OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY

NOV 17 1964

CURRENT SERIAL RECORDS

Packing
MATURE
GREEN TOMATOES:

*Costs, Efficiencies, and Economies
of Scale in the Lower Rio Grande
Valley of Texas*

FOREWORD

This report is the third from a study of market structure and performance in the Lower Rio Grande Valley. Previous reports were:

Tomato Prices and Market Structure in the Lower Rio Grande Valley of Texas, by Joseph C. Podany and Raymond O. P. Farrish, Mktg. Res. Rpt. 588, February 1963.

Packing Mature Green Tomatoes: Quality, Costs, and Margins in the Lower Rio Grande Valley of Texas, by Robert W. Bohall, Joseph C. Podany, and Raymond O. P. Farrish, Mktg. Res. Rpt. 635, November 1963.

The assistance of many tomato packers in the Valley made this study possible. Without their permission to conduct time studies and work samplings, little could have been accomplished. Information obtained in confidence prevents acknowledging each by name.

William J. Cremins of the Marketing Field Office, Fruit and Vegetable Division, USDA Agricultural Marketing Service, McAllen, Tex., helped in planning and initiating the study. Frank Gross, manager of the Texas Valley Tomato Committee, Mercedes, Tex., gave valuable assistance in contacting shippers and provided information on lengths of season, typical plant volumes, etc. Several equipment manufacturers, supply dealers, and building contractors also aided by supplying estimates of replacement costs and prices.

CONTENTS

	<u>Page</u>
Foreword	iii
Summary	v
Int'roduction	1
Objectives	1
Methods	1
The nature of tomato packing operations	2
Model sheds: Physical requirements and costs	4
Floor plans and building costs	4
Equipment requirements and costs	6
Labor requirements and costs	7
Other costs	12
Variations in total costs	12
The effect of quality variations on costs	12
The effect of container variations on costs	16
The effect of length of season on costs	16
Observed versus model sheds	22
Comparison of efficiency on selected operations	22
Possible improvements in present sheds	22
Implications and trends	29
Appendix I.	34
Appendix II	40
Building costs of model sheds	40
Other costs	40

Washington, D.C.

November 1964

SUMMARY

Costs, efficiencies, and economies of scale in packing mature green tomatoes in the Lower Valley, were determined for model sheds of small, medium, and large capacities. Variable and fixed costs for alternative methods in each stage of the packing operation were estimated and least cost combinations applied to model plants. Conditions of tomato quality, type of containers, and length of packing season were standardized, based on observations in 9 selected Valley sheds. Average tomato quality consisted of 66 percent U.S. No. 1 grade, 16.7 percent U.S. No. 2 grade, and 12 percent culls. The remaining 5.3 percent were pink or ripe tomatoes, which are separated out and sold separately from the mature green fruit. With this average quality, 300 40-pound cartons per hour were packed in the small, 550 in the medium, and 925 in the large model shed. The average length of packing season was 200 hours.

Costs per 40-pound carton were 83 cents in a medium-size model shed. This was distributed as 3 cents for buildings, 5 cents for equipment, 12 cents for labor, and 63 cents for other costs, including 38 cents for containers. Total costs per carton in a small shed were 91 cents and for a large model shed, 81 cents. In moving from small to medium shed size, economies of 8 cents were realized, or a reduction of 1 cent each on building and equipment cost, 3 cents on labor, and 3 cents on other costs. The large shed had slightly lower costs per unit for buildings, labor, and other costs, but slightly higher equipment costs. The net result was a 2-cent saving per carton.

Estimates for the change in packing costs associated with a change in quality were developed from observations made in selected Lower Valley tomato packing sheds of varying average outputs per packing-line worker. For a medium-size shed of above average output per man hour, packing costs per 40-pound equivalent of tomatoes increased by 13 cents when quality decreased from 60 percent to 40 percent U.S. No. 1 grade. For the sheds observed in the study, costs of packing tomatoes increased as quality fell.

Since 1960, the use of wooden lugs and wirebound crates (WBC) has changed to the almost exclusive use of the 40-pound fiberboard carton. The cost of packing 40 pounds of tomatoes in WBC was estimated as 80 cents in the medium-size model shed. This is 3 cents less than the cost of packing tomatoes in cartons and 56 cents less than the cost of packing in lugs. Packing costs alone do not explain the reasons for shifts in containers. Differences in packing costs can be offset by premiums that buyers are willing to pay for tomatoes in certain containers.

Based on 1961 sales data, the premium paid for 40 pounds of size 6x7 U.S. No. 1 grade tomatoes packed in cartons was 12 cents over the price of 40 pounds packed in WBC or 9 cents more than the difference in packing costs. The premium paid for 40 pounds of U.S. No. 1 grade 6x6 tomatoes packed in lugs was 54 cents over WBC or 2 cents less than the difference in packing costs. Therefore, it was more profitable to pack WBC than lugs and more profitable to pack cartons than either WBC or lugs.

The length of packing season has a substantial effect on per unit packing costs. Packing costs for the medium-size model shed operating 100 hours per season were estimated at \$1.04 per 40-pound carton. This compares with 83 cents for a 200-hour and 76 cents for a 300-hour season. To a certain extent, weather conditions limit the number of days in the Lower Valley tomato-packing season. Therefore, attempts to increase volume and length of season have been limited to competitive bidding for existing volume and to increased emphasis on financial control of production in order to guarantee volume.

There are several methods that can be used in any one shed operation and the most automatic, least labor combination may not be the least cost method. The labor and equipment cost of a shed operation is sometimes lower using variable labor inputs instead of mechanical inputs, which have a higher fixed charge but a lower variable cost. As the packing season lengthens, the use of automatic equipment becomes more advantageous.

In many instances, observed sheds were found to have higher labor and equipment costs than model sheds. This was usually because of a short operating season, inefficient utilization of labor, and inefficient methods of operation. Average differences between observed-shed and model-shed costs were 12.2 cents in the small sheds, 6.2 cents in the medium-size sheds and 9 cents in the large sheds. Observed-shed labor and equipment costs ranged from a low of 16.2 cents to a high of 52.8 cents per 40-pound equivalent.

PACKING MATURE GREEN TOMATOES: COSTS, EFFICIENCIES, AND ECONOMIES OF SCALE IN THE LOWER RIO GRANDE VALLEY OF TEXAS

by

Robert W. Bohall, Raymond O. P. Farrish ^{1/}, and Joseph C. Podany
Agricultural Economists
Marketing Economics Division
Economic Research Service

INTRODUCTION

In the four southernmost counties of Texas, which comprise the Lower Rio Grande Valley, mature green tomatoes are shipped to market primarily during May and June. With a high degree of competition from other producing areas, and with a substantial number of shippers in the Valley, individual packing sheds have little influence on tomato prices. Prices paid to farmers are largely the result of f.o.b. prices and packing costs. Since prices paid to growers influence their profits, they are interested in efficient, low-cost packing operations. Profits of shippers are the excess of revenue over costs, so they also are interested in reducing packing costs.

OBJECTIVES

This report discusses costs, efficiencies, and economies of scale in packing mature green tomatoes for fresh market in the Lower Rio Grande Valley of Texas. Packing costs are estimated for model plants of three capacities under assumed conditions of tomato quality, type of containers packed, and length of packing season. Variations in these items are also considered, and their influence on costs estimated. Finally, the efficient model plants developed are compared with existing plants, and suggestions are made for improvements in the operations of present plants.

Efficiency in this study is measured by packing costs per unit volume--low unit costs represent high efficiency, and vice versa. No attempt is made to develop, or even suggest, new methods or equipment. The objective was the more modest one of estimating which combinations of present methods result in least cost.

METHODS

Nine tomato packinghouses in the Lower Valley were intensively studied in May and June of 1962. These were selected for variations in capacity, layout, type of containers packed, and packing technologies. For this study, the packing of mature green tomatoes was divided into various stages or operations. Among the observed packing sheds, several methods were used to complete each operation, and cost estimates were derived for each method.

The volume of incoming green tomatoes dumped onto the packing line and the volume of packed tomatoes by grade and size were recorded during each observation. Actual performance, work sampling, and time study observations were made of shed workers. The sample sheds supplied information on wage rates, operating costs, and

^{1/} Mr. Farrish transferred in April 1963 to the College of Agriculture, University of Arizona, as Extension Marketing Specialist.

overhead expenses. Estimates of construction costs were obtained from local contractors, and estimates of equipment replacement costs from equipment manufacturers. Power costs were estimated using a standard consumption of electricity per motor horsepower per hour, with local rates applied.

Labor costs were derived using wage rates and estimates of labor requirements based on observations of shed workers. Labor and equipment costs were combined to obtain an estimate of the cost for each method used in the various shed operations. Total costs for a packing shed were the sum of costs for each stage plus costs of buildings and other expenses unrelated to any one operation.

Cost estimates were then synthesized for model sheds representing three different capacities. The model sheds were assumed to be packing tomatoes typical of the sample sheds in 1962. Labor and equipment costs for model sheds are based on least cost methods, or on combinations of methods resulting in least costs for several related shed operations. Total costs for the model sheds include building, labor, equipment, and other costs.

THE NATURE OF TOMATO PACKING OPERATIONS

Tomato packing is a fairly straightforward operation (see flow chart, fig. 1). The packing operation consists of cleaning; waxing; sorting and packing by color, grade, and size; and loading packed fruit onto rail or truck transportation.

Upon arrival at the shed, field boxes are unloaded from trucks and transported to the dumping station. Dumping tomatoes onto the packing line is a manual operation in most Lower Valley sheds as the short tomato season does not usually provide sufficient volume to justify investment in a mechanical dumper. The packing line in this study refers to the series of operations tomatoes pass through from the time they are emptied from the field box until they reach shipping containers. The packing line usually is of the same width throughout, normally 36 or 48 inches.

After being washed and dried, and after having pinks and most of the culls removed at the first grading table, the tomatoes pass through a waxer and then to the second grading table, where U.S. No. 2 grade tomatoes are removed. The Federal marketing order for the Texas Valley, in operation since 1960, has limited shipments to U.S. No. 2 grade or better with one exception. In the spring of 1964, due to heavy rains which adversely affected quality, regulations were lowered. Sizes packed are 7 x 7, 6 x 7, 6 x 6 and larger, but frequently size 5 x 6 and larger tomatoes are packed separately from size 6 x 6. Size 7 x 8 tomatoes are sometimes allowed late in the season.

Mature green tomatoes of U.S. No. 1 and U.S. No. 2 grade are then automatically sized on separate belt sizers. Packing takes place, after tomatoes are sized, at separate stations for each grade and size. Undersize tomatoes are diverted to culls.

Container supply firms deliver packing material to the shed where workers assemble the containers, which are then placed on overhead conveyors to packers. Packing methods vary, depending upon the type of container used. Tomatoes to be packed in 40-pound cartons or 60-pound wirebound crates (WBC) are jumble-packed and usually are allowed to roll directly off the crossbelt from the sizer, via a chute, into containers. Tomatoes that are to be packed in 30-pound lugs and 20-pound flats are transported from the sizer crossbelt by a wide distributing belt which carries them to sloping bins where they are hand-wrapped and individually placed in the lug or flat.

FLOW DIAGRAM FOR TOMATO PACKING SHED

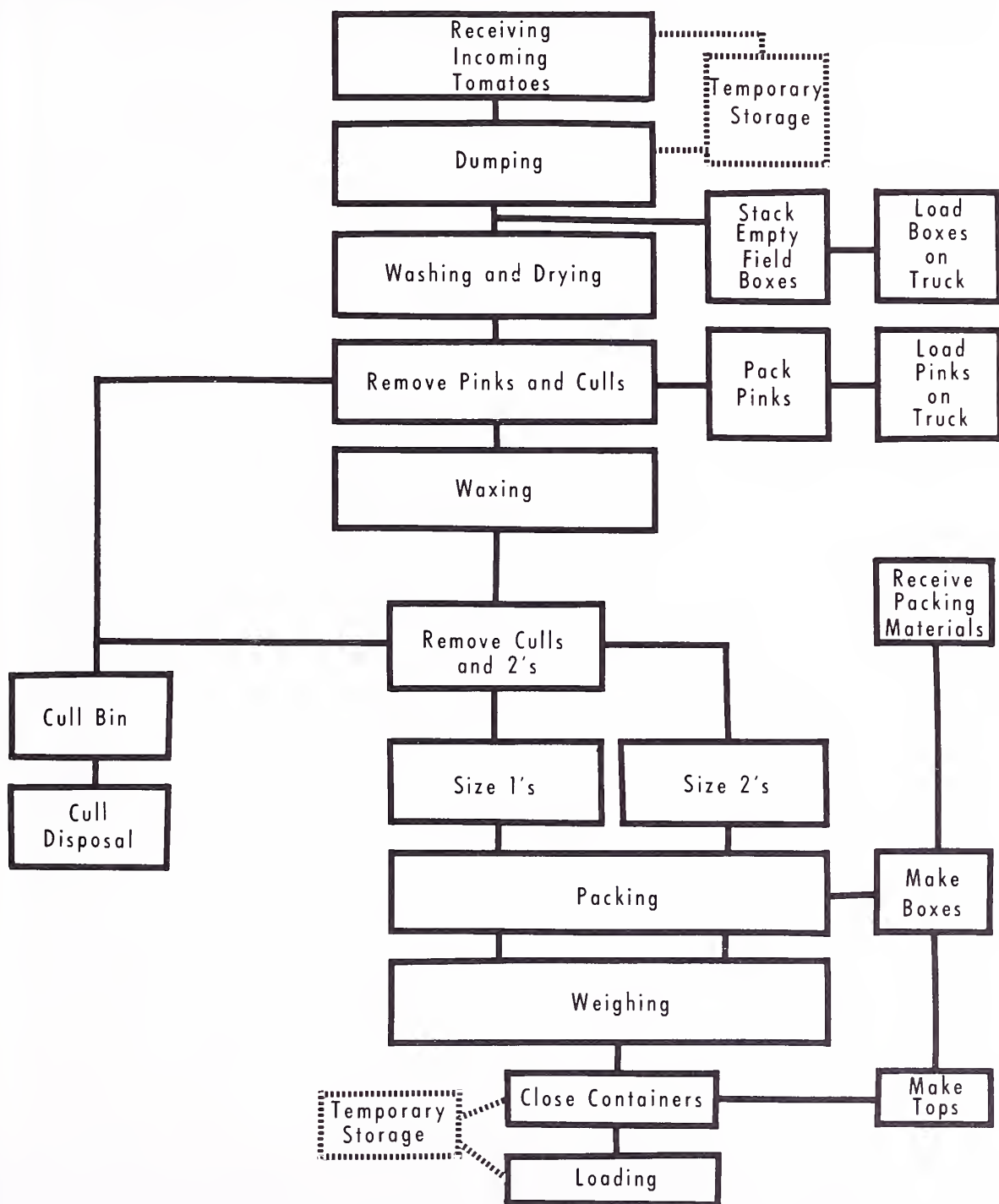


Figure 1

Packers identify the contents of each packed container by grade and size prior to sending it on to the weighing station. Then the container is closed and moved to temporary storage or railcars and trucks for transportation to market. Valley shippers usually load around 30,000 pounds of packed tomatoes in one railcar or truck. Common loads consist of 750 40-pound cartons or 500 60-pound WBC.

MODEL SHEDS: PHYSICAL REQUIREMENTS AND COSTS

Least cost estimates were synthesized for packing tomatoes in 3 model sheds representing the small-, medium- and large- capacity operations found in the Lower Valley. It was assumed that the average quality and grades of tomatoes packed by the 9 selected sheds during observation periods also would be packed in the model sheds. Under such conditions, the small model shed would be packing 12,000 pounds of tomatoes per hour, the medium-size shed 22,000 pounds, and the large shed 37,000 pounds (table 1). Out of 9 packing shed operations observed in the Valley, 4 were small, 2 were medium-size and 3 were large.

Table 1.--Model packing sheds: Input and output of mature green tomatoes per hour, Lower Rio Grande Valley, Tex., 1962 ^{1/}

Item	Unit	Small shed	Medium-size shed	Large shed
Tomatoes dumped:				
48-pound field boxes ^{2/}	Number	284	521	876
Total weight.....	Pound	13,636	25,000	42,045
Culls:				
48-pound field boxes.....	Number	34	62	105
Total weight.....	Pound	1,636	3,000	5,045
Packout:				
40-pound cartons.....	Number	300	550	925
U.S. No. 1 grade.....	do.	225	413	694
U.S. No. 2 grade.....	do.	57	104	176
Pink and ripe.....	do.	18	33	55
Total weight.....	Pound	12,000	22,000	37,000

^{1/} Tomato volume composed of 12 percent culls, 66 percent U.S. No. 1 grade, 16.7 percent U.S. No. 2 grade, and 5.3 percent pinks and ripens.

^{2/} Number of field boxes rounded to the nearest 48-pound box.

Floor Plans and Building Costs

The arrangements of equipment and floor space for the model sheds are similar in most respects. The small shed is designed for manual dumping and for handtruck, in-plant transportation. The medium-size shed differs in the method of dumping and in the transportation of packed boxes. Hence, a distributing belt is needed and the shed is larger to allow for forklift trucks. Two packing lines are necessary in the large model shed and tomatoes are dumped automatically (fig. 2). The sheds are designed for packing tomatoes in cartons or WBC.

FLOOR PLANS FOR MODEL TOMATO PACKING SHEDS

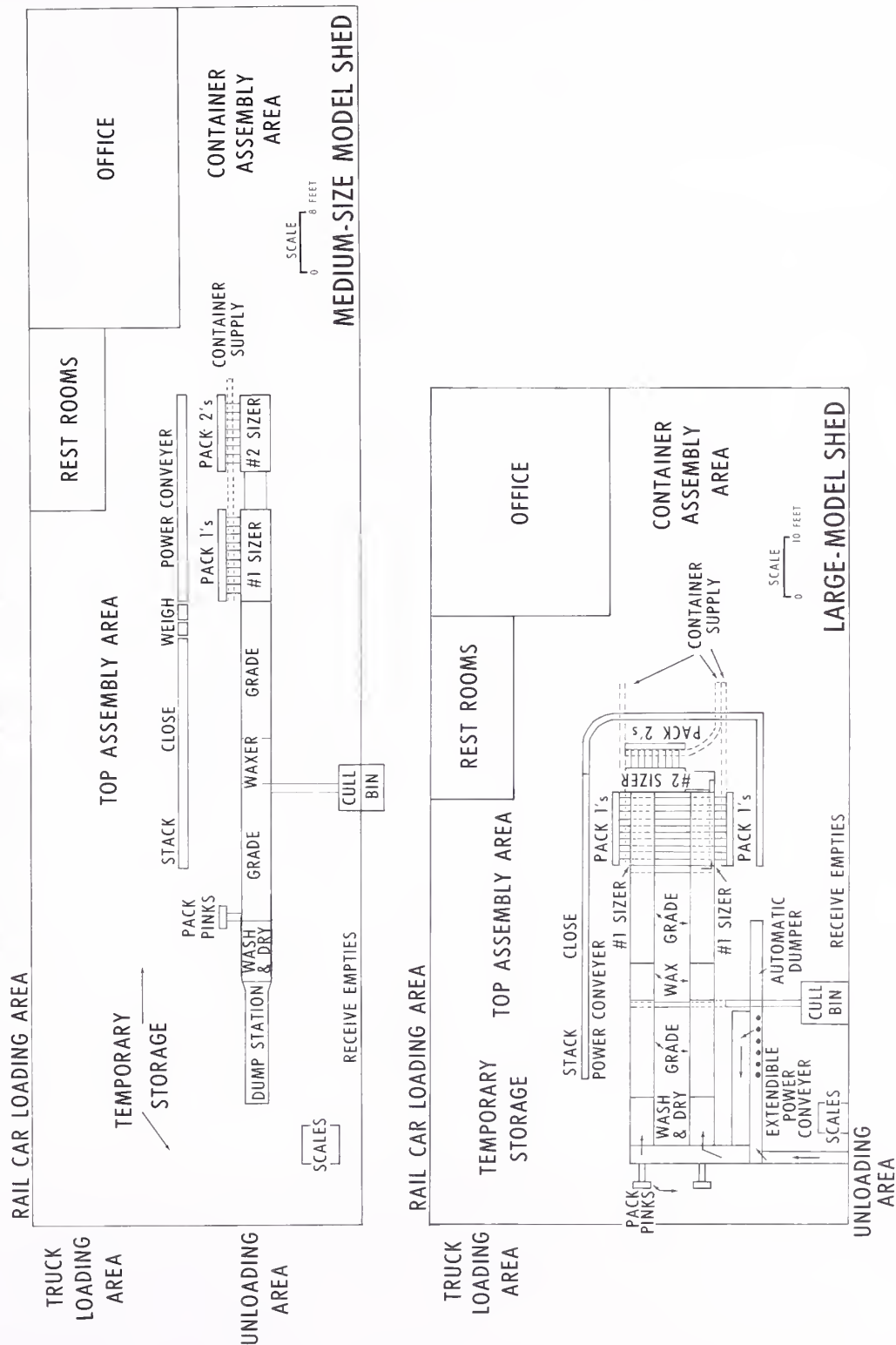


Figure 2

Each model shed has adjoining rail facilities. Rail transportation is the dominant method of transporting packed tomatoes, but trucks are commonly used for part of the requirements. Model sheds are, therefore, at truckbed height.

The least cost construction combination for the model sheds includes a concrete floor, wood-frame roof, and galvanized or open-wire siding. Roof trusses are assumed to give a clear height of 12 feet, with roof spans of 30 to 40 feet. 2/ The least cost siding is open-sides, but for limited security the wire mesh or galvanized siding is commonly used.

The estimated construction cost of the small model shed is \$25,000, of the medium-size \$34,500, and of the large \$42,000 (table 2). Based on a 40-year use life, annual fixed expenses are estimated to be 9.4 percent of total construction costs. In terms of cost per 40-pound equivalent of packout in a 200-hour season, the small-shed cost is 3.9 cents, the medium-size 2.9 cents, and the large shed 2.1 cents. 3/

Table 2.--Model packing sheds: Building size and costs, Lower Rio Grande Valley, Tex., 1962 1/

Item	Unit	Small shed	Medium-size: shed	Large shed
Size of shed.....	Foot	38 x 122	44 x 160	70 x 126
	Square foot:	4,636	7,040	8,820
Replacement cost per square foot:	Dollar	5.39	4.90	4.77
Total cost of shed.....	do.	24,988	34,496	42,071
Use life.....	Year	40	40	40
Annual fixed cost <u>2/</u>	Percent	9.4	9.4	9.4
Total annual cost.....	Dollar	2,349.05	3,242.63	3,954.69
Depreciation.....	do.	624.70	862.40	1,051.78
Insurance.....	do.	149.93	206.98	252.44
Repairs.....	do.	449.87	620.93	757.28
Taxes.....	do.	249.88	344.96	420.71
Interest.....	do.	874.67	1,207.36	1,472.48
Cost per 40-pound equivalent....	Cent	3.915	2.948	2.138

1/ Average hourly packout, small shed 300 40-pound cartons; medium-size shed 550; large shed 925.

2/ Annual fixed costs as a percentage of total replacement costs: depreciation 2.5 percent, insurance 0.6 percent, repairs 1.8 percent, taxes 1 percent, and interest 3.5 percent.

Equipment Requirements and Costs

The estimated replacement cost of new equipment installed in the packing shed was based on information from several Lower Valley equipment dealers. 4/ The

2/ See appendix for information on the cost of other types of tomato-shed construction.

3/ 40-pound equivalent is 40 pounds of tomatoes packed in either cartons or WBC.

4/ See table 14, appendix.

estimated model shed equipment requirements were then derived for the least cost operations for a 200-hour season.

It might be expected that the large model shed would have equipment economies of scale and, therefore, less equipment cost per unit of packout than the medium-size shed. If both were to use the same equipment, this might be the case. However, the least cost combination for some operations in the large shed included more equipment and less labor than in the medium-size shed (table 3). The substitution of capital for labor reduced the labor cost per unit of packout for the large shed but increased the equipment expense. ^{5/}

The estimated total replacement cost of equipment was \$22,149 for the small model shed, \$30,805 for the medium-size shed, and \$55,211 for the large shed (table 4). For a 200-hour season, the cost per 40-pound equivalent was 6.4 cents in the small shed, 5.1 cents in the medium-size, and 5.4 cents in the large. Regardless of shed size, the most costly equipment for Lower Valley tomato packing was for sizing and grading operations. Another major equipment item was field boxes, furnished by the shipper.

Labor Requirements and Costs

Labor requirements for the model plants represent what reasonably competent workers can be expected to do in a shed operation at or near capacity. Work standards developed from observations of selected packing sheds were used to determine labor requirements under different operating conditions. ^{6/} The labor requirement for a particular operation represents the number of employees needed with given equipment. It does not represent the fewest workers possible assuming automation of the shed.

The cost of labor in the model sheds is based on the minimum wage which employees in the observed shed generally received. The wage rate per man-hour was \$1.15 plus 6 cents for social security and other labor benefits. Salaries of shed managers, supervisors, office employees, salesmen, and shed owners are not included in labor costs.

Thirty-six workers are needed in the small model shed, 53 in the medium size, and 84 in the large (table 5). In all sheds, the greatest input of labor is required for the grading operations, which are difficult to automate. Other in-shed operations requiring considerable labor are packing and container assembly. The labor cost per 40-pound equivalent of packout would be 14.5 cents in the small model shed, compared with 11.7 cents in the medium-size and 11 cents in the large.

An average hourly wage of \$1.50 plus 8 cents for benefits would raise labor costs per unit by 5.5, 3.5, and 3.3 cents in the small, medium-size, and large model sheds. Total labor costs per 40-pound equivalent would be 19 cents in the small shed, 15.2 cents in the medium-size, and 14.3 in the large model shed.

Labor costs per unit of packout decrease as model shed size increases from small to large capacity. One reason for this is that efficiency in use of labor differs among the model sheds. Since labor is not divisible, underemployment of workers is more likely in the smaller sheds. A comparison is made between actual work requirements and number of workers in the model sheds. Workers in the small model shed would be 77 percent employed, compared with 87 percent in the medium-size

^{5/} See page 21 for more information on the substitution of capital for labor.

^{6/} See table 15, in appendix.

Table 3.--Model packing sheds: Equipment and total annual equipment cost for a 200-hour season, by shed operation, Lower Rio Grande Valley, Tex., 1962, 1/

Shed operation and Equipment	Small shed		Medium-size shed		Large shed	
	Unit	Annual cost 2/	Unit	Annual cost 2/	Unit	Annual cost 2/
	Number	Dollars	Number	Dollars	Number	Dollars
Equipment needed for--						
Weighing incoming tomatoes:						
Light duty truck scale.....	1	73.34	1	73.34	1	73.34
Handtruck.....	1	14.67	1	14.67	1	14.67
Unloading tomatoes from field truck:						
Extendable power conveyer.....	-	--	-	--	1	149.67
Handtruck.....	2	29.33	2	29.33	-	--
Dumping full field boxes:						
Automatic dump, pineapple type.....	-	--	-	--	1	757.35
Cross belt, 36" x 14'.....	-	--	-	--	1	140.06
Distributing belt, 36" x 16'.....	-	--	1	157.90	-	--
Dump hopper, 36".....	1	20.53	-	--	-	--
Returning empty field boxes:						
Handtruck.....	-	--	1	14.67	-	--
Washing tomatoes:						
Washer, 36".....	1	115.94	-	--	-	--
Washer, 48".....	-	--	1	127.67	2	255.34
Drying:						
Dryer, 36".....	1	209.84	-	--	-	--
Dryer, 48".....	-	--	1	224.50	2	449.00
Grading:						
Grading tables 36" x 11', with	2	273.00	-	--	-	--
16" x 11' crossbelt.....	2	167.32	-	--	-	--
Grading tables 48" x 18', with	-	--	2	469.74	-	--
16" x 18' crossbelt.....	-	--	2	211.80	-	--
Grading tables 48" x 16' with	-	--	-	--	4	880.80
16" x 16' crossbelt.....	-	--	-	--	4	404.00
Sizing:						
5-belt 48" sizer.....	-	--	1	397.61	2	795.22
Crossbelt 16" x 12'.....	-	--	1	86.93	1	86.93
Elevator 36" x 5'.....	-	--	1	82.67	1	82.67
Crossbelt 16" x 16'.....	-	--	-	--	1	101.00
5-belt 36" sizer.....	1	366.77	-	--	-	--
4-belt 48" sizer.....	-	--	-	--	1	337.44
4-belt 36" sizer.....	-	--	1	308.11	-	--
4-belt 24" sizer.....	1	278.77	-	--	-	--
Crossbelt 12" x 12'.....	1	75.50	-	--	-	--
Elevator 24" x 5'.....	1	68.00	-	--	-	--
Packing U.S. No. 1 grade:						
Crossbelts with chute 16" x 4'.....	5	336.65	5	336.65	-	--
Crossbelts with chute 16" x 18'.....	-	--	-	--	5	529.50
Packing U.S. No. 2 grade:						
4 crossbelts with chutes (single						
unit) 16" x 4'.....	1	147.40	1	147.40	1	147.40

See footnotes at end of table.

Table 3.--Model packing sheds: Equipment and total annual equipment cost for a 200-hour season, by shed operation, Lower Rio Grande Valley, Tex., 1962, 1/--Continued

Shed operation and equipment	Small shed		Medium-size shed		Large shed	
	Unit	Annual cost <u>2/</u>	Unit	Annual cost <u>2/</u>	Unit	Annual cost <u>2/</u>
	Number	Dollars	Number	Dollars	Number	Dollars
Packing pinks:						
Crossbelts with chute 16" x 4'.....	1	67.33	1	67.33	2	134.66
Weighing:						
Power conveyer 27'.....	1	102.50	1	102.50	--	--
Light scale.....	1	29.33	2	58.66	--	--
Scale--on packing line.....	--	--	--	--	8	117.32
Closing:						
No equipment needed.....	--	--	--	--	--	--
Stacking:						
Power conveyer 15" x 30'.....	1	110.67	1	110.67	--	--
Power conveyer 15" x 25'.....	--	--	--	--	1	97.60
Power conveyer 15" x 50'.....	--	--	--	--	1	156.26
90° power turn.....	--	--	--	--	1	43.34
20' roller conveyer.....	--	--	--	--	2	23.46
Transportation to load:						
Handtruck.....	2	29.34	--	--	--	--
Forklift <u>3/</u>	--	--	1	281.50	1	281.50
Pallets.....	--	--	92	37.25	147	59.52
Additional conveyer <u>4/</u>	--	--	--	55.39	--	117.21
Loading:						
No equipment needed.....	--	--	--	--	--	--
Container assembly and supply:						
Box conveyer 30'.....	1	32.67	1	32.67	2	65.33
Curved box conveyer 25'.....	--	--	--	--	1	37.57
Cull disposal:						
Crossbelt 12" x 5'.....	1	59.17	--	--	--	--
Crossbelt 12" x 15'.....	1	82.03	--	--	--	--
Culls bins = 6' x 6' x 5'.....	1	26.40	--	--	--	--
6' x 6' x 9'.....	--	--	1	47.66	--	--
7' x 8' x 10½'.....	--	--	--	--	1	86.54
Handtruck.....	1	14.67	1	14.67	1	14.67
Crossbelt 12" x 12'.....	--	--	1	75.50	--	--
Crossbelt 16" x 18'.....	--	--	--	--	1	105.90
Elevator 12" x 20'.....	--	--	1	94.09	--	--
16" x 20'.....	--	--	--	--	1	110.80
Other:						
Trip scale.....	1	14.67	1	14.67	1	14.67
Office equipment.....	--	277.60	--	440.90	--	669.55
Field boxes.....	2,272	827.01	4,168	1,517.15	7,008	2,550.91
Total.....	--	3,850.45	--	5,633.60	--	9,891.20
		<u>Cents</u>		<u>Cents</u>		<u>Cents</u>
Cost per 40-pound equivalent.....	--	6.41	--	5.12	--	5.35

1/ Model sheds are designed for a 200-hour season. 2/ See Appendix I for detailed information on replacement cost, hourly variable cost, and annual fixed cost. 3/ Assumes $\frac{1}{4}$ annual fixed cost is allocated to tomatoes. 4/ Additional power conveyer needed over stacking requirement.

Table 4.---Model packing sheds: Total equipment replacement costs, variable costs per hour, and annual fixed cost, by shed operation, Lower Rio Grande Valley, Tex., 1962 1/

Shed operation	Small shed			Medium-size shed			Large shed		
	Equipment: Variable:		Annual	Equipment: Variable:		Annual	Equipment: Variable:		Annual
	replace- :	cost per:	fixed :	replace- :	cost per:	fixed :	replace- :	cost per:	fixed :
	ment cost:	hour 2/ :	cost 3/ :	ment cost:	hour 2/ :	cost 3/ :	ment cost:	hour 2/ :	cost 3/ :
	Dollars	Cents	Dollars	Dollars	Cents	Dollars	Dollars	Cents	Dollars
Weighting incoming tomatoes..	600	3.00	82.01	600	3.00	82.01	600	3.00	82.01
Unloading field trucks.....	200	1.00	27.33	200	1.00	27.33	1,000	6.50	136.67
Dumping full field boxes.....	140	.70	19.13	930	7.65	142.60	5,830	43.40	810.61
Returning empty field boxes..	--	--	--	100	.50	13.67	--	--	--
Washing.....	770	5.35	105.24	850	5.75	116.17	1,700	11.50	232.34
Drying.....	1,400	9.25	191.34	1,500	9.75	205.00	3,000	19.50	410.00
Grading.....	2,800	20.50	399.32	4,340	33.70	614.14	8,160	64.80	1,155.20
Sizing.....	5,240	32.70	723.64	5,810	36.30	802.72	9,280	58.15	1,286.96
Packing U.S. No. 1 grade.....	2,000	15.00	306.65	2,000	15.00	306.65	3,150	23.25	483.00
Packing U.S. No. 2 grade.....	875	6.62	134.16	875	6.62	134.16	875	6.62	134.16
Packing pinks.....	400	3.00	61.33	400	3.00	61.33	800	6.00	122.66
Weighting.....	800	6.25	119.33	1,000	7.25	146.66	800	4.00	109.32
Closing.....	--	--	--	--	--	--	--	--	--
Stacking.....	650	5.50	99.67	650	5.50	99.67	1,925	16.38	287.90
Transportation to load.....	200	1.00	27.34	1,687	46.43	281.28	2,171	50.35	357.53
Loading.....	--	--	--	--	--	--	--	--	--
Container assembly and supply.....	200	1.00	30.67	200	1.00	30.67	630	3.15	96.60
Cull disposal.....	1,220	8.10	180.74	1,545	9.22	228.15	2,080	13.40	305.78
Office equipment.....	1,700	8.50	260.60	2,700	13.50	413.90	4,100	20.50	628.55
Field boxes.....	2,954	14.77	797.47	5,418	27.09	1,462.97	9,110	45.55	2,459.81
Total cost.....	22,149	142.24	3,565.97	30,805	232.26	5,169.08	55,211	396.05	9,099.10
Total cost per 40-pound equivalent.....	--	.474	5.94	--	.422	4.70	--	.428	4.92

1/ Sheds are designed for a 200-hour season.

2/ Variable costs are: repairs, 0.5 percent of replacement cost per 100 hours and power, 3 cents per motor horse-power per hour.

2/ Annual fixed cost as a percentage of replacement costs are: taxes, 1 percent; interest, 3.5 percent; insurance, 1 percent; and repairs, 1.5 percent. Depreciation was based on the expected use life of equipment.

Table 5.--Model packing sheds: Number of workers and hourly cost of labor, by shed operation, Lower Rio Grande Valley, Tex., 1962, 1/

Shed operation	Small shed			Medium-size shed			Large shed		
	Workers 2/	Hourly cost : : of labor 3/	Workers 2/	Hourly cost : : of labor 3/	Workers 2/	Hourly cost : : of labor 3/	Workers 2/	Hourly cost : : of labor 3/	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	
Weighing incoming tomatoes.....	1	1.21	1	1.21	1	1.21	1	1.21	
Unloading field trucks.....	2	2.42	2	2.42	2	2.42	2	2.42	
Dumping full field boxes.....	2	2.42	2	2.42	2	2.42	1	1.21	
Returning empty field boxes.....	-	--	1	1.21	1	1.21	2	2.42	
Grading.....	11	13.31	19	22.99	32	38.72			
Packing U.S. No. 1 grade.....	3	3.63	5	6.05	8	9.68			
Packing U.S. No. 2 grade.....	1	1.21	2	2.42	3	3.63			
Packing pinks.....	1	1.21	1	1.21	2	2.42			
Weighing.....	1	1.21	2	2.42	4	4.84			
Closing.....	1	1.21	2	2.42	3	3.63			
Stacking.....	1	1.21	2	2.42	3	3.63			
Transportation to load.....	2	2.42	1	1.21	1	1.21			
Loading.....	2	2.42	2	2.42	4	4.84			
Container assembly and supply.....	6	7.26	9	10.89	15	18.15			
Cull disposal.....	1	1.21	1	1.21	1	1.21			
Maintenance.....	1	1.21	1	1.21	2	2.42			
Total.....	36	43.56	53	64.13	84	101.64			
Cost per 40-pound equivalent.....	--	Cents 14.52	--	Cents 11.66	--	Cents 10.99			

1/ Sheds are designed for a 200-hour season.

2/ Salaries of shed managers, supervisors, office employees, salesmen, and shed owners are included in other costs (table 6).

3/ \$1.21 per man-hour or \$1.15 minimum wage in 1962 and \$0.06 for fringe benefits.

model shed and 89 percent in the large. A second reason for lower labor costs per unit of packout in the medium-size and large model sheds is the greater use of automatic equipment which replaces labor.

Other Costs

Information on other costs (other than for buildings, labor, and equipment) was obtained in interviews with shed owners and managers, insurance and utility companies, equipment dealers, and from published data. 7/ The largest of these costs is cost of containers (table 6). This varies directly with each unit of packout. In the observed sheds in 1962, it averaged 38 cents per 40-pound carton. The salaries of employees such as shed managers and office clerical help constitute another important other-cost item, ranging from \$8,500 in the small model shed to \$19,300 in the large shed. The total other costs is \$40,014 per year in the small, \$69,727 in the medium-size, and \$115,376 in the large model shed. On a per unit basis, this is equal to 66.7 cents per 40-pound equivalent in the small model shed, 63.4 cents in the medium, and 62.4 cents in the large.

Variations in Total Costs

Total costs estimated for the three model sheds operating under typical Lower Valley conditions at or near 100 percent of capacity indicate that as shed size increases, costs per unit of packout decrease (table 7). Larger sheds can afford to install automatic equipment for replacing labor--for example, automatic dumping equipment. Additional economies of scale result from the more intensive use of equipment and effective employment of labor in the larger sheds.

At 100 percent of capacity, the difference in per unit packing costs between the small and medium-size model sheds operating a 200-hour packing season is 8.4 cents. The comparable cost difference between the medium-size and large model sheds is 2.3 cents. This suggests that further reduction in per unit packing costs with sheds of greater scale probably would be small. A comparison of per unit costs for the model sheds operating at 70 percent of capacity indicated the difference between the small and medium-size model sheds would be 12 cents.

THE EFFECT OF QUALITY VARIATIONS ON COSTS

The nature of tomato-packing operations virtually assures that costs will vary with quality. The speed of a tomato-packing line is governed by the maximum number of tomatoes that workers can remove in any given time interval. For example, assume that two lots, weighing 100 pounds each, are dumped. If lot A has only 50 percent U.S. No. 1 grade tomatoes while lot B has 80 percent U.S. No. 1 grade, workers on the grading tables have to handle more fruit with lot A than lot B. Assuming maximum line speed, either the lower quality lot A will be packed at a slower rate or additional graders will be required. In both cases, output per worker will vary with changes in quality. (Usually the line speed is adjusted, since changing the number of workers often runs into space and labor limitations.)

7/ Meyer, Charles H. Tomato Repacking Methods and Equipment. U.S. Dept. Agr. Mktg. Res. Rpt. 579, Oct. 1963.

Table 6.---Model packing sheds: Total other costs, 200-hour season, Lower Rio Grande Valley, Tex., 1962 1/

Item	Unit	Rate	Small shed		Medium-size shed		Large shed	
			Dollars		Dollars		Dollars	
Containers.....	40-pound carton	0.38	22,800.00		41,800.00		70,300.00	
Tomato committee.....	do.	.00667	400.00		733.33		1,233.33	
Inspection service.....	do.	.025	1,500.00		2,750.00		4,625.00	
Telephone & telegraph.....	do.	.01333	800.00		1,466.66		2,466.66	
Office supplies.....	do.	.0015	90.00		165.00		277.50	
Waxing.....	do.	.02	1,200.00		2,200.00		3,700.00	
Chlorine sterilization.....	Per 30,000 pounds	2/	1,192.00		2,119.32		3,379.32	
Electric power.....	Per kilowatt hour	0.03	177.09		266.64		338.52	
Other utilities.....	Per hour	3/	80.00		140.00		220.00	
Overtime inspection 4/.....	do.	2.00	100.00		100.00		100.00	
Insurance.....	Per employee	2.50	102.50		157.50		247.50	
Cull disposal.....	Per pound of culls	.0006	196.20		360.00		605.40	
Salaried labor.....	Season	---	8,540.00		12,660.00		19,320.00	
Automobile expense.....	do.	---	1,600.00		2,400.00		4,000.00	
Telephone & telegraph.....	do.	---	60.00		100.00		150.00	
Interest on capital.....	do.	---	425.92		758.30		1,262.31	
Legal and audit.....	do.	---	500.00		1,000.00		2,000.00	
Advertising.....	do.	---	---		100.00		200.00	
Dues and subscriptions.....	do.	---	100.00		200.00		400.00	
Donations.....	do.	---	100.00		200.00		500.00	
Office supplies.....	do.	---	50.00		50.00		50.00	
Total.....	do.	---	40,013.71		69,726.75		115,375.54	
Variable costs.....	do.	---	30,641.21		55,579.25		92,708.04	
Fixed costs.....	do.	---	9,372.50		14,347.50		22,667.50	
Total.....	40-pound carton		Cents		Cents		Cents	
Variable costs.....	do.	---	66.69		63.39		62.37	
Fixed costs.....	do.	---	51.07		50.35		50.12	
	do.	---	15.62		13.04		12.25	

1/ Cost other than buildings, labor, and equipment. See Appendix II for detailed information.

2/ \$14.90 small shed, \$14.45 medium, \$13.70 large.

3/ \$0.40 small shed, \$0.70 medium, \$1.10 large shed.

4/ 50 hours per shed.

Table 7.--Model packing sheds: Total and per unit costs for 200-hour operating season, Lower Rio Grande Valley, Tex., 1962

Item	Total cost 200-hour season			Cost per 40-pound equivalent		
	Small shed	Medium-size shed	Large shed	Small shed	Medium-size shed	Large shed
	Dollars	Dollars	Dollars	Cents	Cents	Cents
Buildings:						
Depreciation.....	624.70	862.40	1,051.78	1.04	0.79	0.57
Insurance.....	149.93	206.98	252.44	.25	.19	.14
Repairs.....	449.87	620.93	757.28	.75	.56	.41
Taxes.....	249.88	344.96	420.71	.42	.31	.23
Interest.....	874.67	1,207.36	1,472.48	1.46	1.10	.79
Total.....	2,349.05	3,242.63	3,954.69	3.92	2.95	2.14
Equipment:						
Fixed cost						
Depreciation.....	2,015.53	3,011.82	5,234.32	3.36	2.74	2.83
Insurance.....	221.49	308.50	552.11	.37	.28	.30
Repairs.....	332.24	462.08	828.17	.55	.42	.45
Taxes.....	221.49	308.50	552.11	.37	.28	.30
Interest.....	775.22	1,078.18	1,932.39	1.29	.98	1.04
Total.....	3,565.97	5,169.08	9,099.10	5.94	4.70	4.92
Variable cost:						
Repairs.....	221.49	308.50	552.11	.37	.28	.30
Power.....	62.99	156.02	239.99	.10	.14	.13
Total.....	284.48	464.52	792.10	.47	.42	.43
Total equipment cost.....	3,850.45	5,633.60	9,891.20	6.41	5.12	5.35
Labor:						
Dumping, grading, packing.....	4,356.00	7,018.00	11,132.00	7.26	6.38	6.02
Assemble, supply container.....	1,452.00	2,178.00	3,630.00	2.42	1.98	1.96
Other shed labor....	2,904.00	3,630.00	5,566.00	4.84	3.30	3.01
Total labor cost..	8,712.00	12,826.00	20,328.00	14.52	11.66	10.99
Other costs:						
Cull disposal.....	196.20	360.00	605.40	.33	.33	.33
Variable cost per unit.....	27,982.00	51,234.31	85,981.81	46.64	46.58	46.47
Variable cost per hour.....	2,463.01	3,784.94	6,120.83	4.10	3.44	3.31
Fixed annual cost....	9,372.50	14,347.50	22,667.50	15.62	13.04	12.25
Total other cost....	40,013.71	69,726.75	115,375.54	66.69	63.39	62.36
Grand total....	54,925.21	91,428.98	149,549.43	91.54	83.12	80.84

For this study, "quality" was measured by the percentage of U.S. No. 1 grade in the total weight of all tomatoes dumped. On the average, for selected firms in the study, a 1-percent change in quality was associated with a 9.8-pound change in output per man-hour on the packing line. Hence, a 10-percent increase in quality, say from 50 to 60 percent U.S. No. 1 grade, would, on the average, raise output per man-hour on the packing line by 98 pounds. This relation was essentially the same in all 9 observed sheds. ^{8/}

Packing-line labor is not the only cost which varies with quality. With a decrease in quality, lines are slowed and there is less packout to bear the costs of packing. Hence, all costs except those directly related to the number of 40-pound equivalents packed--for example, containers--will be spread over fewer units of packout, increasing the average packing cost per unit.

The effect that quality has on packing costs depends on the level of output per packing-line worker. In the medium-size shed, if output per packing-line worker is assumed to be the average found in the observed plants, a change in quality from 70 to 40 percent U.S. No. 1 grade tomatoes increases the cost per 40-pound equivalent by 29 cents (see table 16 in appendix). ^{9/} With above average output per packing-line worker, the same change in quality of tomatoes increases the cost by 17 cents. As quality drops below 60 percent U.S. No. 1 grade, the effect on costs becomes quite large (fig. 3).

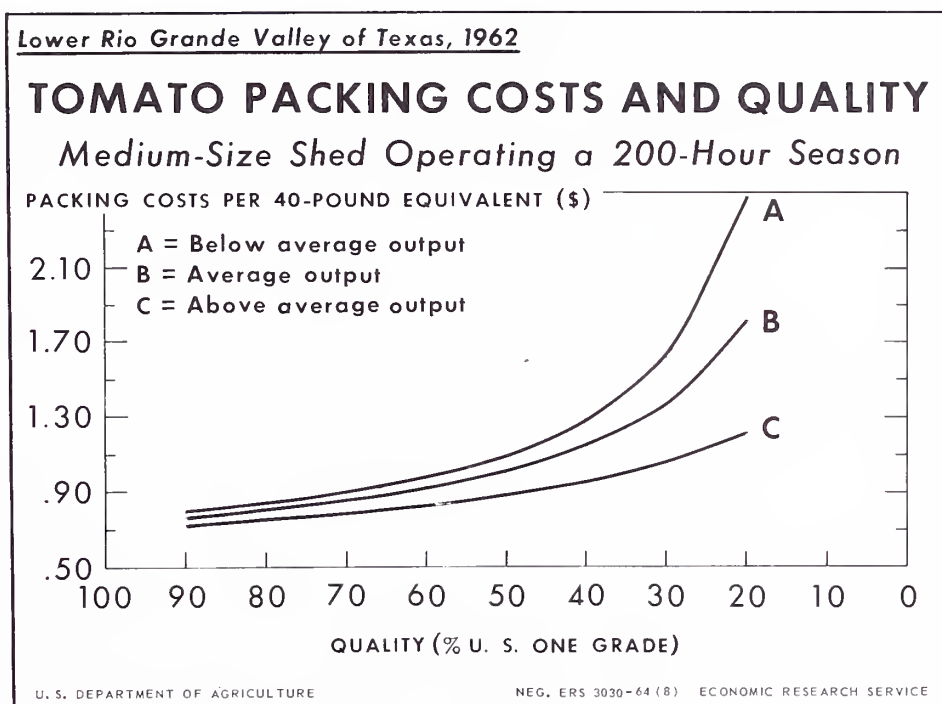


Figure 3

^{8/} Bohall, R. W., Podany, J. C., and Farrish, R. O. P. Packing Mature Green Tomatoes: Quality, Costs, and Margins in the Lower Rio Grande Valley of Texas. U.S. Dept. Agr. Mktg. Res. Rpt. 635, Nov. 1963.

^{9/} The medium-size model shed for which costs are presented would be between average and above average in output per packing-line worker.

THE EFFECT OF CONTAINER VARIATIONS ON COSTS

Data from the past 4 marketing seasons for Lower Rio Grande Valley tomatoes indicate a marked change in type of containers used in packing (table 8). In 1960, wirebound crates were used for 60 percent of the volume packed and wooden lugs or flats for most of the remainder. A few 40-pound fiberboard cartons were packed, but information on volume is not available. In 1963, 4 years later, 97 percent of the volume was packed in cartons, 2 percent in wirebound crates, and a small amount in wooden lugs or flats.

One reason for the decline of wooden lugs and flats is price in relation to packing costs. Tomatoes in these containers are usually individually hand-wrapped and place-packed. Also, the container cost of lugs and flats is almost double that of WBC or cartons for an equivalent amount of tomatoes. Packing in lugs raises labor, equipment, and container packing costs markedly. If higher costs are offset by a premium price, then lugs continue to be packed despite the additional inputs required in comparison to cartons and WBC.

In the 1961 tomato season, the average daily price of a lug of tomatoes was equal to one-half the price of a wirebound crate plus 41 cents--that is, tomatoes in 30-pound lugs were selling at a premium of 41 cents over the equivalent weight of tomatoes packed in wirebound crates. 10/

For the medium-size model packing shed, the cost of packing in lugs is estimated to exceed the cost of packing in wirebound crates by 42 cents per 30-pound equivalent (derived from table 9). This would indicate that the premium received for lugs is more than offset by the additional packing costs. The model sheds represent reasonably efficient facilities operating at or near capacity. In actual practice, shed costs are apt to be higher than those synthesized for the model sheds. This would be especially true in a shed packing lugs where there are additional workers and machines to be coordinated.

The shift from the 60-pound WBC to the 40-pound carton is evidently due to the willingness of buyers to pay a premium for tomatoes packed in cartons. If no premium were paid for cartons, the WBC would probably have continued to be a commonly used container. Both WBC and cartons are jumble-packed so, with no premium, the expected price of a 40-pound carton is two-thirds the price of a 60-pound WBC. Two comparisons were made between 1961 daily average prices for tomatoes in wirebound crates and in cartons (table 10). The daily average price per 40 pounds was 4 cents higher for U.S. No. 1 grade size 6x6 tomatoes packed in cartons. An extra 12 cents was paid for size 6x7 in cartons. The difference in packing cost between cartons and wirebound crates is mainly in the cost of the container, 2.7 cents less for wirebound crates. On this basis, the premium paid for cartons would have been 1.3 cents for size 6x6 and 9.3 cents for size 6x7 tomatoes above the difference in container costs. Comparable data were not obtained for seasons after 1961, but the fact that cartons are now the dominant container indicates that they continue to command a premium from the trade.

THE EFFECT OF LENGTH OF SEASON ON COSTS

The tomato season in the Lower Rio Grande Valley is relatively short, compared with areas such as Florida or California. In 1962, the observed sheds ran an average

^{10/} Podany, J. C., and Farrish, R. O. P. Tomato Prices and Market Structure in the Lower Rio Grande Valley of Texas. U.S. Dept. Agr. Mktg. Res. Rpt. 588, Feb. 1963.

Table 8.---Shipments of tomatoes by type of container for each grade and size, Lower Rio Grande Valley, Tex., 1960-63

Container, grade, and size	1960			1961			1962			1963		
	Unit	Percentage of : total volume	Unit	Percentage of : total volume	Unit	Percentage of : total volume	Unit	Percentage of : total volume	Unit	Percentage of : total volume	Unit	Percentage of : total volume
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
40-lb. fiberboard cartons:												
U.S. No. 1 grade:												
6x6 and larger.....	NA	--	106,444	5	516,644	22	291,010	28	416,293	41		
6x7.....	NA	--	319,652	15	794,576	35	111,279	11				
7x7 and smaller.....	NA	--	55,344	2	215,263	9						
Total.....	NA	--	481,440	22	1,526,480	66	818,582	80				
U.S. No. 2 grade:												
6x6 and larger.....	NA	--	32,004	2	158,047	7	86,184	9				
6x7.....	NA	--	26,847	1	145,404	6	73,989	7				
7x7 and smaller.....	NA	--	5,426	1/	29,310	1	13,959	1				
Total.....	NA	--	64,277	3	332,761	14	174,132	17				
60-lb. wirebound crates:												
U.S. No. 1 grade:												
6x6 and larger.....	125,465	15	301,385	21	89,535	5	4,291	1				
6x7.....	175,831	22	198,353	14	45,177	3	1,685	1/				
7x7 and smaller.....	47,509	6	60,567	4	8,640	1	1,274	1/				
Total.....	348,805	43	560,305	39	143,352	9	7,250	1				
U.S. No. 2 grade:												
6x6 and larger.....	71,142	9	166,428	11	64,865	4	2,600	1/				
6x7.....	60,508	7	82,177	6	41,011	3	2,082	1/				
7x7 and smaller.....	11,097	1	8,406	1	4,011	1/	320	1/				
Total.....	142,747	17	257,011	18	109,887	7	5,002	1				
30-lb. wooden lugs:												
U.S. No. 1 grade:												
6x6 and larger.....	109,144	7	153,178	5	20,745	1	1,612	1/				
6x7.....	261,594	16	130,482	5	27,886	1	2,851	1/				
7x7 and smaller.....	130,556	8	64,993	2	12,226	1/	2,028	1/				
Total.....	501,294	31	348,653	12	60,857	2	6,491	1/				
U.S. No. 2 grade:												
6x6 and larger.....	47,785	3	72,158	3	21,637	1	5,949	1/				
6x7.....	77,531	5	71,554	2	21,079	1	6,329	1/				
7x7 and smaller.....	15,913	1	15,744	1	4,557	1/	562	1/				
Total.....	141,229	9	159,456	6	47,073	2	12,840	1				
Total.....	---	100	---	100	---	100	---	100	---	100	---	100

1/ Less than 0.5 percent.

Source: Texas Valley Tomato Committee.

Table 9.--Model packing shed, medium size: Cost of packing in different containers for 200-hour season, Lower Rio Grande Valley, Tex., 1962

Item	Type of container					
	40-pound fiberboard carton		60-pound wirebound crate		30-pound wooden lug	
	Total	Per 40-pound equivalent	Total	Per 40-pound equivalent	Total	Per 40-pound equivalent
	Dollars	Cents	Dollars	Cents	Dollars	Cents
Buildings.....	3,242.63	2.95	3,242.63	2.95	4,685.56	4.26
Equipment:						
Packing.....	502.14	.45	502.14	.45	3,139.64	2.85
Weighing.....	161.16	.15	161.16	.15	--	--
Closing.....	--	--	760.00	.69	827.30	.75
Container assembly and supply.....	32.67	.03	32.67	.03	1,936.05	1.76
Other equipment.....	4,937.63	4.49	4,937.63	4.49	4,937.63	4.49
Total.....	5,633.60	5.12	6,393.60	5.81	10,840.62	9.85
Labor costs:						
Packing.....	968.00	.88	968.00	.88	17,952.00	16.32
Weighing.....	484.00	.44	484.00	.44	--	--
Closing.....	484.00	.44	242.00	.22	968.00	.88
Clerical.....	--	--	--	--	242.00	.22
Loading.....	484.00	.44	484.00	.44	2,178.00	1.98
Container assembly and supply.....	2,178.00	1.98	1,936.00	1.76	1,452.00	1.32
Other labor costs.....	8,228.00	7.48	8,228.00	7.48	8,228.00	7.48
Total.....	12,826.00	11.66	12,342.00	11.22	31,020.00	28.20
Other costs:						
Containers.....	41,800.00	38.00	38,866.65	35.34	75,000.00	68.18
Inspection.....	2,750.00	2.50	2,566.66	2.33	2,933.42	2.67
Insurance.....	157.50	.15	152.50	.14	232.50	.21
Electrical utilities.....	266.64	.24	266.64	.24	393.00	.36
Other.....	24,752.61	22.50	24,752.61	22.50	24,752.61	22.50
Total.....	69,726.75	63.39	66,605.07	60.55	103,311.53	93.92
Total costs.....	91,428.98	83.12	88,583.29	80.53	149,857.71	136.23

Table 10.--Average daily price paid for U.S. No. 1 grade tomatoes, size 6x6 and 6x7, packed in cartons and WBC, Lower Rio Grande Valley, Tex., 1961

Date	Average daily prices			
	U.S. No. 1 size 6x6		U.S. No. 1 size 6x7	
	Carton	WBC	Carton	WBC
	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
May:				
4.....	2.87	4.64	--	--
5.....	2.67	4.40	--	--
6.....	2.00	4.31	--	--
8.....	2.01	3.47	1.97	2.96
9.....	1.73	3.19	2.02	2.76
10.....	2.33	3.37	1.81	2.73
11.....	2.55	3.24	1.90	2.81
12.....	2.33	3.15	1.80	2.79
13.....	2.53	3.04	1.95	2.84
15.....	--	--	1.69	2.65
16.....	2.00	3.15	1.72	2.59
17.....	2.09	2.91	1.75	2.42
18.....	2.09	2.66	1.69	2.65
19.....	1.97	3.05	1.74	2.52
20.....	1.96	3.03	1.73	2.30
22.....	2.50	4.13	--	--
23.....	2.24	3.29	1.73	2.61
24.....	1.98	3.20	1.76	3.00
25.....	2.21	3.15	1.65	2.79
26.....	2.01	3.22	1.60	2.73
27.....	2.09	2.89	1.75	1.97
29.....	2.06	3.23	2.05	2.75
30.....	2.29	3.50	2.25	2.97
31.....	2.94	3.18	2.29	3.29
June:				
1.....	--	--	2.77	3.24
2.....	2.75	4.77	2.52	3.64
3.....	4.66	6.40	3.43	4.01
6.....	--	--	4.05	5.45
7.....	5.35	5.72	3.77	5.36
8.....	5.25	7.40	3.96	5.40
9.....	4.47	7.90	3.96	5.90
10.....	5.40	7.75	--	--
Average.....	2.74	4.05	2.27	3.23
Average per 40-pounds.....	2.74	2.70	2.27	2.15

of 190 hours. None of these sheds operated as long as 300 hours, but some operated less than 110 hours.

Fixed inputs, incurred on an annual basis, are an expense to the shed regardless of the length of operating season. If a shed operates over a longer season, output is increased and fixed costs per unit are, therefore, reduced (see table 17 in appendix). Figure 4 illustrates the effect of length of season on per unit costs. Per unit costs for the medium-size model shed designed for a 200-hour season are \$1.04 for a 100-hour, 83 cents for a 200-hour, and 76 cents for a 300-hour season. Further reductions in fixed costs per unit can be expected with even longer tomato seasons.

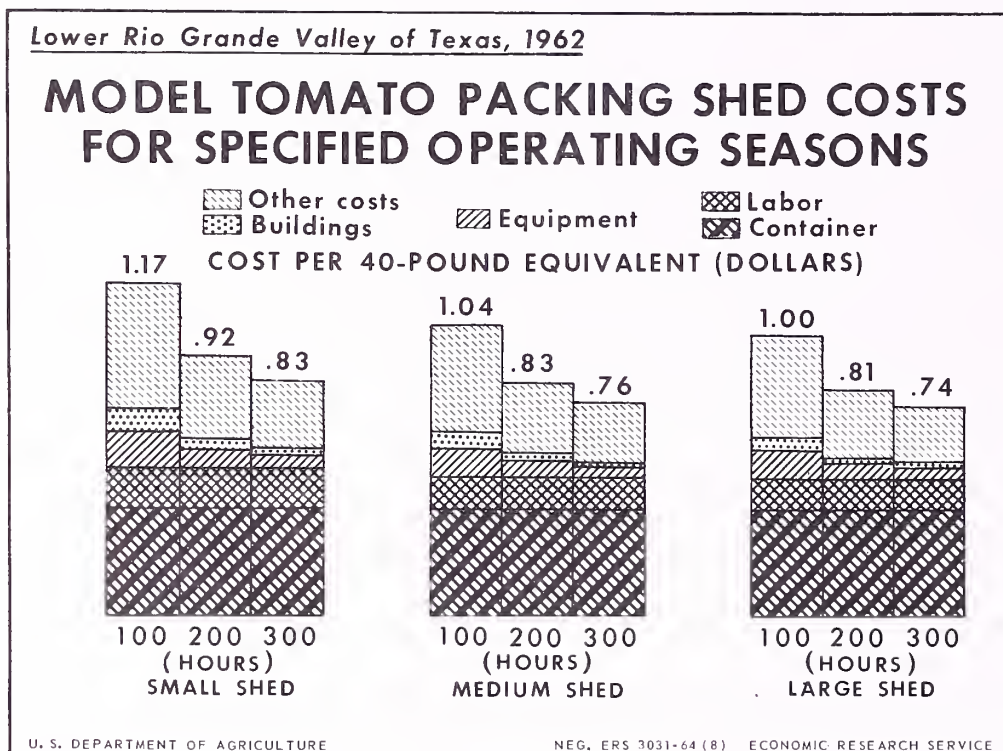


Figure 4

The length of the Lower Valley green tomato marketing season is a function of the number of hours a shed operates per day and the number of days during the season. If either or both--hours per day or days per season-- are increased, the length of the tomato season increases.

The number of days in the tomato season is subject to the uncertainty of the weather of the Lower Rio Grande Valley. The probability of winter freezes influences planting dates and, in turn, the start of the harvest season. High winds and brief periods of low temperatures in early spring often cause initial fruit set to be poor and erratic. The possibility of an advance in the harvest date depends on introduction of new varieties or techniques that would encourage fruit set despite vagaries of weather. Rains and hot weather in June cause rapid quality deterioration, which ends the green tomato season. Therefore, climatic conditions largely control the length of the tomato season.

The immediate possibility of extending the tomato season is an increase in the hours of operation per day by obtaining an additional volume of tomatoes. Two methods of obtaining this additional volume are: (1) to attempt to bid away a portion of the tomatoes going to other packers, and (2) to gain financial control of the production of tomatoes in order to guarantee their availability to the shed. Method 1 is limited since Valley shippers appear to be highly competitive. 11/ Any price increase by one firm will be followed by increases by other firms and a negligible increase in that firm's volume. Use of method 2 by Valley shippers has increased in recent years. Several of the sheds participating in the study indicated that they financed some tomato production.

An effect of attempting to attain efficiency by extending the length of the season is to cause less efficient firms to leave the tomato market. This in turn releases additional volume to the remaining firms. In 1959, there were 43 firms packing tomatoes, compared with 37 in 1960, 34 in 1961, and 33 in 1962. 12/

The relationship between length of operating season and fixed costs illustrates why many of the Lower Valley tomato packers cannot profitably use automatic equipment such as automatic dumpers. Labor, in 1962, was generally available at the minimum wage of \$1.15 per hour plus 6 cents for fringe benefits. One worker could be replaced by \$1,000 worth of equipment in a shed averaging 100 hours operation per season, provided that the expected use life of the equipment was 22 years (fig. 5). In a shed running 200 hours, a use life of 7 years would be sufficient, and a 4-year use life would

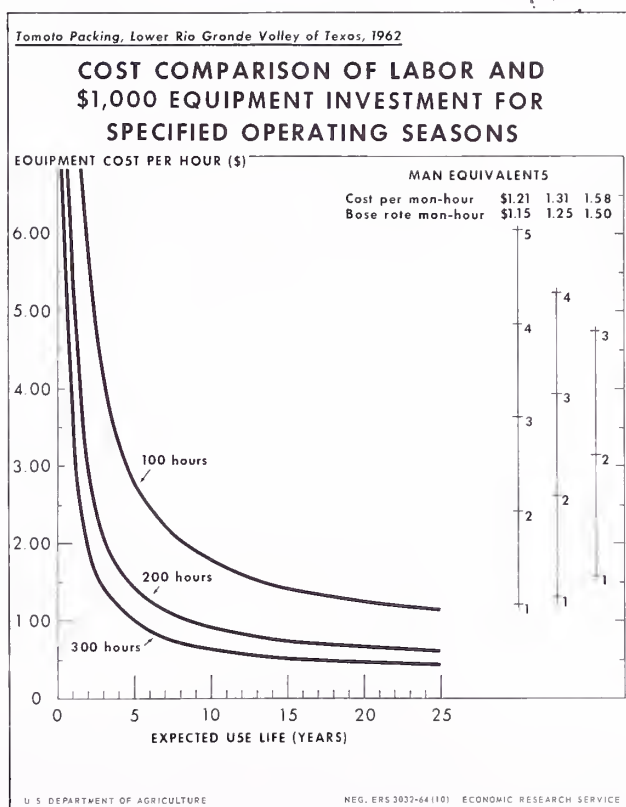


Figure 5

11/ Podany and Farrish (see footnote 10).

12/ This data was supplied by the Texas Valley Tomato Committee.

be enough if the shed runs 300 hours per season. Thus, the longer the operating season, the greater is the incentive to replace labor inputs with capital inputs in the form of labor-saving equipment.

For a shed operating 200 hours per season, an increase in wages from \$1.15 to \$1.25 requires a use life for \$1,000 worth of machinery of 6 instead of 7 years to economically replace one worker, and only 5 years if wages rise to \$1.50 per hour.

OBSERVED VERSUS MODEL SHEDS

Comparison of Efficiency on Selected Operations

Previous sections have shown estimated costs of packing mature green tomatoes for 3 model sheds of small, medium, and large capacity, which were packing tomatoes of average quality, grade, and size as observed in 1962. Variations from least cost methods of operation used in the model sheds are the rule rather than the exception in the Valley. With variations in the length of packing season, in type of containers packed, in tomato quality, and in shed capacities, other methods of operation might compare favorably with the least cost methods of the model sheds.

Table 11 illustrates the cost of alternative methods for some of the medium-size and large shed operations. The equations of fixed and variable costs for each method are based on conditions in model sheds. For ease in computing cost per unit, total costs for different lengths of packing seasons have been reduced to a 100-cartons-of-packout basis. For example, the cost of unloading in the medium-size shed using method A would be \$384.67 per 100-hour season or 70 cents per 100 cartons. Comparable figures are 58 cents and 53 cents for seasons of 200 and 300 hours.

In considering least cost combinations by shed operation, it may be necessary to consider several shed operations in conjunction with one another. The method of dumping may depend on the method of unloading full field boxes or the method of returning empty field boxes to trucks. Thus, when 3 operations (unloading, dumping, and returning empties) are considered together, the least cost method for dumping is found to be method G for less than 149 hours in the large model shed and method E for 149 or more hours (fig. 6).

In general, as the packing season gets longer, methods with high initial fixed costs and a low variable input are apt to cost least. In a short season, methods requiring less fixed inputs but more variable costs (usually in the form of labor) may have the least cost advantage. In the medium-size shed, combination A of stacking, transportation to load, and loading costs least for a season of less than 122 hours (fig. 7). Combination B then is least cost for a season of 122 hours or longer. The main difference in the methods is a shift from high variable costs to low variable costs and an opposite change in annual fixed costs.

Possible Improvements in Present Sheds

Model-shed methods were selected to obtain the least cost or most efficient packing operation. The question is how much more efficient (if at all) the model sheds are than the sheds observed in 1962, and what savings might result if the observed sheds were to use the methods of the model sheds.

Two comparisons of labor and equipment costs were made to measure possible savings from use of model-shed rather than observed-shed methods. First, an estimate was made of the costs in the model sheds when observed-shed methods of operating

Table 11.--Medium-size and large model packing sheds: Cost of labor and equipment for 100-, 200-, and 300-hour seasons, alternative methods of operation, Lower Rio Grande Valley, Tex., 1962

Shed operation	Model shed I/ :	Variable cost per hour :	Fixed cost per year :	Cost for season of--						Cost per 100 units for--					
				Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Unloading 48-pound field boxes:															
A. Manually onto an extendable:	M	2.48	136.67	384.67	632.67	880.67	1,089.00	1,314.79	1,512.66	1,717.97	1,923.31	2,128.61	2,333.91	2,539.21	2,744.51
power conveyor.....	L	2.48	136.67	384.67	632.67	880.67	1,089.00	1,314.79	1,512.66	1,717.97	1,923.31	2,128.61	2,333.91	2,539.21	2,744.51
B. Manually-carry to stack....	M	3.63	--	363.00	726.00	1,089.00	1,452.00	1,815.00	2,178.00	2,541.00	2,904.00	3,267.00	3,630.00	3,993.00	4,356.00
	L	6.05	--	605.00	1,210.00	1,815.00	2,420.00	3,025.00	3,630.00	4,235.00	4,840.00	5,445.00	6,050.00	6,655.00	7,260.00
C. Handtruck 20 ft. to dump	M	2.43	27.33	270.33	513.33	756.33	1,000.00	1,243.33	1,486.66	1,729.99	2,000.00	2,271.11	2,542.22	2,813.33	3,084.44
station.....	L	4.86	54.66	540.66	1,026.66	1,512.66	2,000.00	2,486.66	2,973.33	3,459.99	3,946.66	4,433.33	4,920.00	5,406.66	5,893.33
D. Handtruck to dump station	M	4.86	54.66	540.66	1,026.66	1,512.66	2,000.00	2,486.66	2,973.33	3,459.99	3,946.66	4,433.33	4,920.00	5,406.66	5,893.33
20' return with empty con-															
tainers.....	L	7.29	81.99	810.99	1,539.99	2,268.99	3,000.00	3,729.99	4,459.99	5,189.99	5,920.00	6,650.00	7,380.00	8,110.00	8,840.00
Dumping 48-pound full field boxes:															
E. Automatic dumper.....	M	1.58	683.35	841.35	999.35	1,157.35	1,315.35	1,473.35	1,631.35	1,789.35	1,947.35	2,105.35	2,263.35	2,421.35	2,579.35
	L	1.64	810.61	974.61	1,138.61	1,302.61	1,466.61	1,630.61	1,794.61	1,958.61	2,122.61	2,286.61	2,450.61	2,614.61	2,778.61
F. Manually from stack onto	M	2.50	142.60	392.60	642.60	892.60	1,142.60	1,392.60	1,642.60	1,892.60	2,142.60	2,392.60	2,642.60	2,892.60	3,142.60
distribution belt.....	L	5.01	312.79	813.79	1,314.79	1,815.79	2,316.79	2,817.79	3,318.79	3,819.79	4,320.79	4,821.79	5,322.79	5,823.79	6,324.79
G. Manually from stack into	M	3.64	25.97	389.97	753.97	1,117.97	1,481.97	1,845.97	2,209.97	2,573.97	2,937.97	3,301.97	3,665.97	4,029.97	4,393.97
dump hopper.....	L	6.07	51.94	658.94	1,265.94	1,872.94	2,480.94	3,087.94	3,694.94	4,301.94	4,908.94	5,515.94	6,122.94	6,730.94	7,337.94
H. Manually set on power	M	3.79	298.99	677.99	1,056.99	1,435.99	1,814.99	2,193.99	2,572.99	2,951.99	3,330.99	3,710.99	4,089.99	4,468.99	4,847.99
conveyor, dump onto dis-															
tributing belt.....	L	5.12	521.31	1,033.31	1,545.31	2,057.31	2,569.31	3,081.31	3,593.31	4,105.31	4,617.31	5,129.31	5,641.31	6,153.31	6,665.31
J. Power conveyor from truck..	M	2.58	298.99	556.99	814.99	1,072.99	1,330.99	1,588.99	1,846.99	2,104.99	2,362.99	2,620.99	2,878.99	3,136.99	3,394.99
	L	2.70	521.31	791.31	1,061.31	1,331.31	1,601.31	1,871.31	2,141.31	2,411.31	2,681.31	2,951.31	3,221.31	3,491.31	3,761.31
Returning empty field boxes to															
truck or storage, from dump															
station:															
K. Wood chute, manual loading..	M	2.43	17.07	260.07	503.07	746.07	989.07	1,232.07	1,475.07	1,718.07	1,961.07	2,204.07	2,447.07	2,690.07	2,933.07
	L	2.43	34.15	277.15	520.15	763.15	1,006.15	1,251.15	1,496.15	1,741.15	1,986.15	2,231.15	2,476.15	2,721.15	2,966.15
L. Power conveyor, manual	M	2.49	122.66	371.66	620.66	869.66	1,118.66	1,367.66	1,616.66	1,865.66	2,114.66	2,363.66	2,612.66	2,861.66	3,110.66
loading.....	L	2.49	122.66	371.66	620.66	869.66	1,118.66	1,367.66	1,616.66	1,865.66	2,114.66	2,363.66	2,612.66	2,861.66	3,110.66
See footnotes at end of table															

Table 11.---Medium-size and large model packing sheds: Cost of labor and equipment for 100-, 200-, and 300-hour seasons, alternative methods of operation, Lower Rio Grande Valley, Tex., 1962--Continued

Shed operation	Model shed 1/ hour	Variable cost per hour	Cost for season of--			Cost per 100 units for--		
			Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
			per year	100 hours	200 hours	300 hours	100 hours	200 hours
								300 hours
M. Automatic dumper return, manual loading.....	M L	2.42 2.42	-- --	242.00 242.00	484.00 484.00	726.00 726.00	.44 .26	.44 .26
N. Unloading crew returns empties.....	ML	--	--	--	--	--	--	--
O. Special handtrucker for empties.....	M L	1.22 1.22	13.67 13.67	135.67 135.67	257.67 257.67	379.67 379.67	.25 .15	.23 .14
Unloading, dumping, and return- ing empties 2/:								
AEM.....	M L	6.48 6.54	820.02 947.28	1,468.02 1,601.28	2,116.02 2,255.28	2,764.02 2,909.28	2.67 1.73	1.92 1.22
AJL.....	M L	7.55 7.67	558.32 780.64	1,313.32 1,547.64	2,068.32 2,314.64	2,823.32 3,081.64	2.39 1.67	1.88 1.25
BFO.....	M L	7.35 12.28	156.27 326.46	891.27 1,554.46	1,626.27 2,782.46	2,361.27 4,010.46	1.62 1.68	1.48 1.50
CFO.....	M L	6.15 11.09	183.60 381.12	798.60 1,490.12	1,413.60 2,599.12	2,028.60 3,708.12	1.45 1.61	1.29 1.40
CGO.....	M L	7.29 12.15	66.97 120.27	795.97 1,335.27	1,524.97 2,550.27	2,253.97 3,765.27	1.45 1.44	1.39 1.38
DGN.....	M L	8.50 13.36	80.63 133.93	930.63 1,469.93	1,780.63 2,805.93	2,630.63 4,141.93	1.69 1.59	1.62 1.52
Grading:								
A. 2 tables per line.....	M L	23.33 39.37	614.14 1,155.20	2,947.14 5,092.20	5,280.14 9,029.20	7,613.14 12,966.20	5.36 5.51	4.80 4.88
B. 2 tables per line plus culls from U.S. No. 2 grading table:	M L	24.58 40.54	702.98 1,182.56	3,160.98 5,236.56	5,618.98 9,290.56	8,076.98 13,344.56	5.75 5.66	5.11 5.02
C. 3 tables per line.....	M L	28.24 46.73	801.89 1,412.40	3,625.89 6,085.40	6,449.89 10,758.40	9,273.89 15,431.40	6.59 6.58	5.86 5.82

See footnotes at end of table.

Table 11.--Medim-size and large model packing sheds: Cost of labor and equipment for 100-, 200-, and 300-hour seasons, alternative methods of operation, Lower Rio Grande Valley, Tex., 1962--Continued

Shed operation	Model shed 1/ :	Variable cost per hour	Fixed cost			Cost for season of--					
			Dollars	per year	:	100 hours		200 hours		300 hours	
						Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Packing:											
D. Jumble-fill cartons.....	M	11.11	502.15			1,613.15	2,724.15	3,835.15	2.93	2.48	2.32
	L	17.30	739.82			2,469.82	4,199.82	5,929.82	2.67	2.27	2.14
E. Place pack in lugs.....	M	88.39	2,981.94			11,820.94	20,659.94	29,498.94	21.49	18.78	17.88
	L	148.09	4,261.29			19,070.29	33,879.29	48,688.29	20.62	18.31	17.54
Weighing and closing:											
A. 1 weighing, 1 closing station:	M	4.90	146.69			636.69	1,126.69	1,616.69	1.16	1.02	.98
B. 2 weighing, 1 closing station.....	M	6.10	158.68			768.68	1,378.68	1,988.68	1.40	1.25	1.21
	L	8.60	246.24			1,106.24	1,966.24	2,826.24	1.20	1.06	1.02
C. 2 weighing, 2 closing stations.....	M	7.32	158.68			890.68	1,622.68	2,354.68	1.62	1.48	1.43
	L	9.80	246.24			1,226.24	2,206.24	3,186.24	1.33	1.19	1.15
D. Weighing stations on packing line, 1 closing station:	M	6.10	109.34			719.34	1,329.34	1,939.34	1.31	1.21	1.18
	L	8.51	109.34			960.34	1,811.34	2,662.34	1.04	.98	.96
E. Weighing stations on packing line, 2 closing stations:	M	7.32	109.34			841.34	1,573.34	2,305.34	1.53	1.43	1.40
	L	9.71	109.34			1,080.34	2,051.34	3,022.34	1.17	1.11	1.09
Stacking, transportation to load:											
and loading:											
A. 1 stacking station, hand-truck to load, manual loading.....	M	8.52	140.69			992.69	1,844.69	2,696.69	1.80	1.68	1.63
	L	13.50	320.70			1,670.70	3,020.70	4,370.70	1.81	1.63	1.58
B. 1 stacking station, forklift to load, manual loading 2/..:	M	6.54	380.93			1,034.93	1,688.93	2,342.93	1.88	1.54	1.42
	L	10.36	623.54			1,659.54	2,695.54	3,731.54	1.79	1.46	1.34
C. 2 stacking stations, forklift to load, manual loading 2/.....	M	6.60	480.59			1,140.59	1,800.59	2,460.59	2.07	1.64	1.49
	L	10.27	556.85			1,583.85	2,610.85	3,637.85	1.71	1.41	1.31
D. Conveyers to load, no stacking, man at each loading point, manual loading.....	M	8.58	196.68			1,054.68	1,912.68	2,770.68	1.92	1.74	1.68
	L	12.30	435.49			1,665.49	2,895.49	4,125.49	1.80	1.57	1.49

See footnotes at end of table.

Table 11.--Medium-size and large model packing sheds: Cost of labor and equipment for 100-, 200-, and 300-hour seasons, alternative methods of operation, Lower Rio Grande Valley, Tex., 1962--Continued

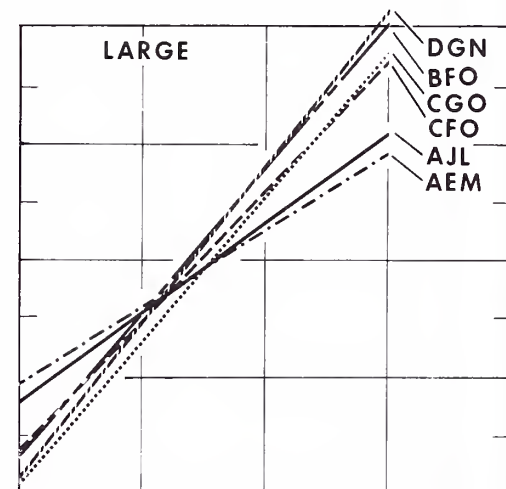
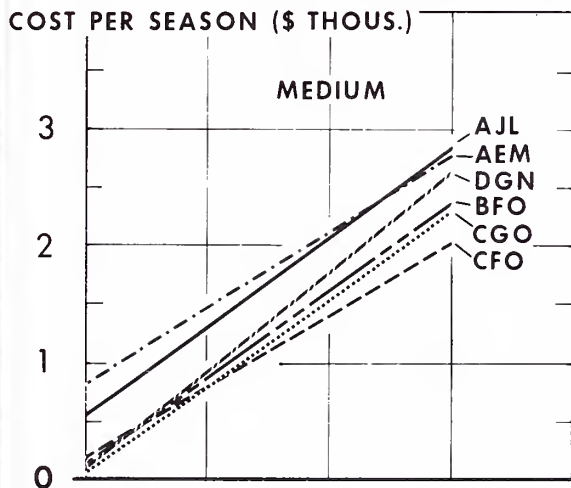
Shed operation	Model shed 1/	Variable cost per hour	Fixed cost per year	Cost for season of--			Cost per 100 units for--				
				Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	
Cull handling and disposal:											
A. Complete mechanization to bin, commercial hauling and disposal.....	M L	2.03 3.31	507.34 621.77	710.34 952.77	913.34 1,283.77	1,116.34 1,614.77	1.29 1.03	.83 .69	.68 .58		
B. Manual and mechanical to bin, commercial hauling and disposal.....	M L	3.10 4.37	228.15 305.78	538.15 742.78	848.15 1,179.78	1,158.15 1,616.78	.98 .80	.77 .64	.70 .58		
C. Mechanical to weigh station, culls weighed and returned to grower.....	M L	2.61 3.84	402.86 467.26	663.86 851.26	924.86 1,235.26	1,185.86 1,619.26	1.21 .92	.84 .67	.72 .58		
D. Manual and mechanical to weigh station, culls weighed and returned to grower.....	M L	3.68 4.91	123.67 151.27	491.67 642.27	859.67 1,133.27	1,227.67 1,624.27	.89 .69	.78 .61	.74 .59		

- 1/ Medium shed (M) handles 550 units per hour; large shed (L), 925 units per hour.
2/ 1st letter identifies method of unloading; 2d, dumping; and 3d, returning empties.
3/ One-fourth annual fixed costs for tomatoes.

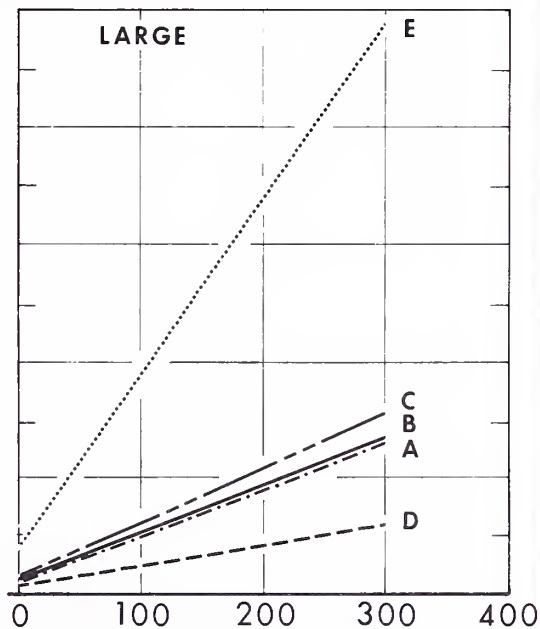
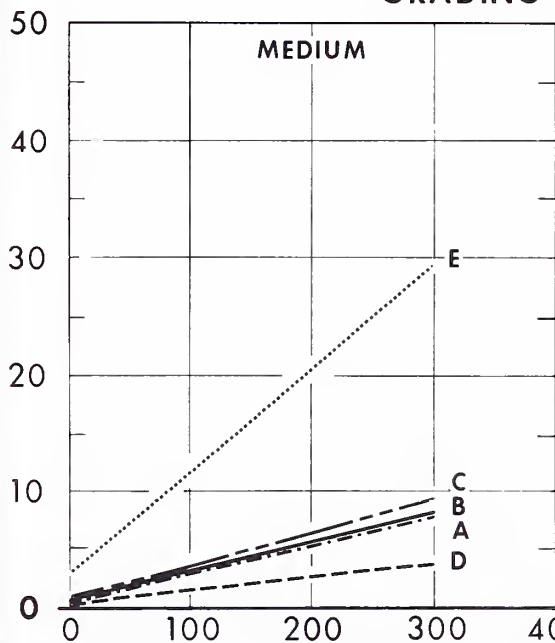
MODEL SHED LABOR AND EQUIPMENT COSTS USING ALTERNATIVE METHODS

Specified Tomato Packing Operations

UNLOADING, DUMPING, AND RETURNING EMPTIES



GRADING AND PACKING



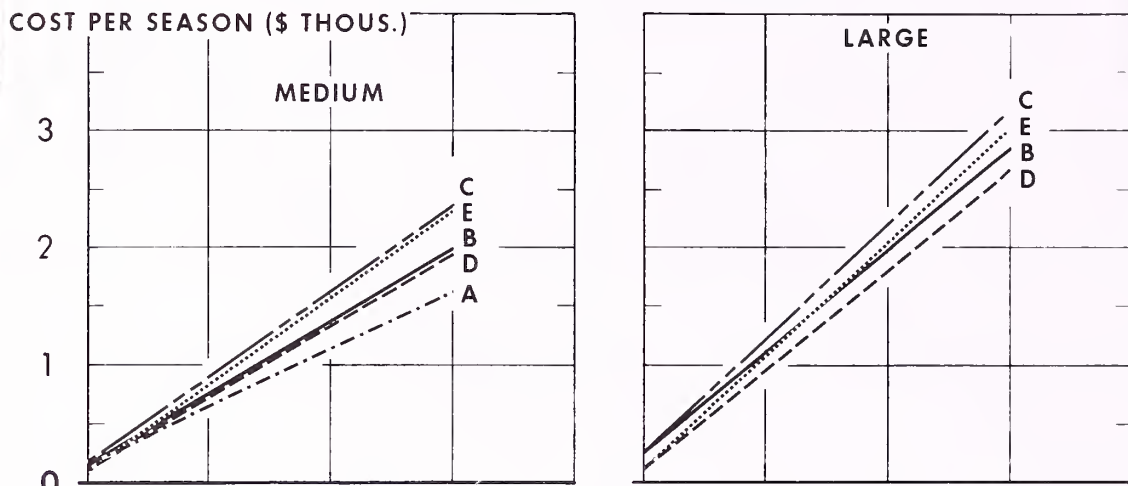
LENGTH OF PACKING SEASON (HOURS)

Figure 6

MODEL SHED LABOR AND EQUIPMENT COSTS USING ALTERNATIVE METHODS

Specified Tomato Packing Operations

WEIGHING AND CLOSING



STACKING, TRANSPORTATION TO LOAD, LOADING

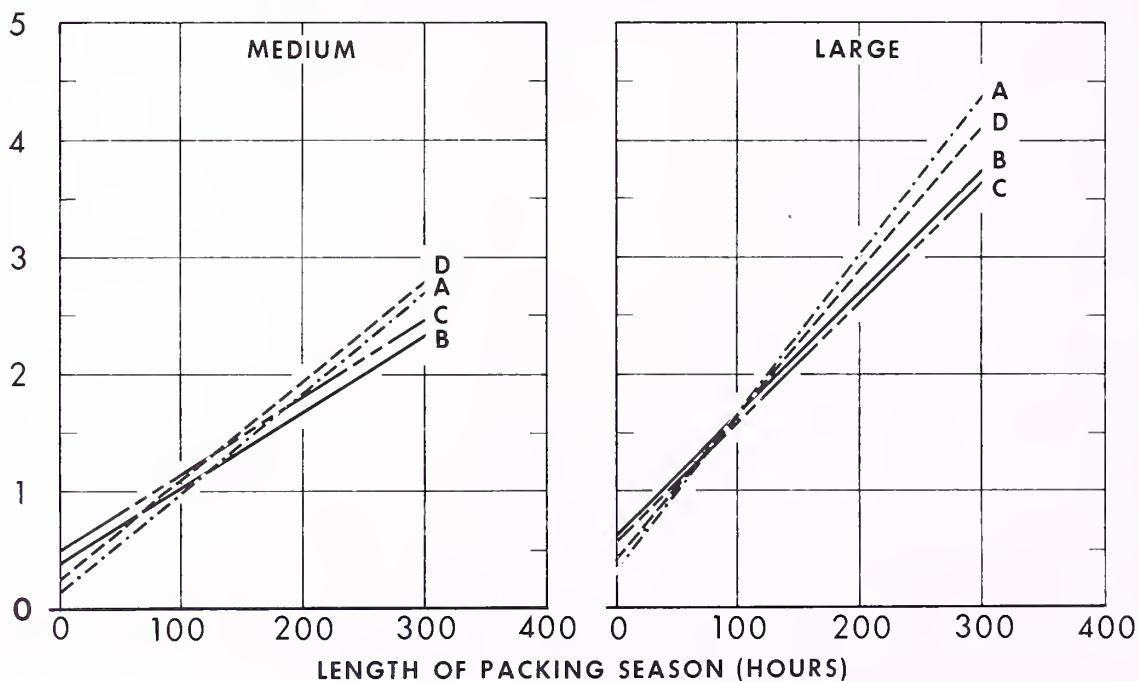


Figure 7

were substituted for least cost methods. When methods used in observed sheds of comparable size were substituted for least cost methods, the average increase in costs was 8.6 cents for the small model shed, 1.7 cents for the medium-size shed, and 7.2 cents for the large shed (table 12).

Second, a comparison was made between model-shed and observed-shed labor and equipment costs. In observed sheds, packout per hour was estimated from shed observations, and number of hours operating was estimated from the time cards of several graders who worked the entire tomato-packing season. Labor and equipment costs per 40-pound equivalent ranged from 16.2 cents in shed 8 to 52.8 cents in shed 3 (table 13). Average differences between observed-shed costs and model-shed costs were 12.2 cents in the small sheds, 6.2 cents in the medium-size and 9 cents in the large sheds. In large shed 8, costs per 40-pound equivalent were 0.5 cent less than for the large model shed.

Table 13 reveals 41 instances where costs in observed sheds were more than 0.5 cent higher per 40-pound equivalent packed than were costs in the comparable model shed. The reasons for these higher costs can be stated as follows:

- (1) A shorter operating season in observed sheds than in model sheds,
- (2) Use of excess labor or labor not fully employed, and
- (3) Inefficient methods, requiring extra labor or equipment.

One or more of the above reasons seems to have contributed enough to raise packing-shed costs 0.5 cent above model-shed costs in many operations. In 13 cases-- 3 for costs of field boxes; 2 for sizing; and 1 each for grading, weighing, stacking, transportation to load, container assembly, weighing incoming tomatoes, cull disposal, and office equipment--operating a longer season would have reduced per unit costs to within 0.5 cent of the model plants. Conversely, sheds using methods similar to model plants may have had per unit costs lower than the model plant due to operating a longer season. One shed had an inefficient unloading operation and another had transportation problems but because of operating a long season, their costs were within 0.5 cent of model-shed costs.

Closer supervision of grading and packing operations to bring productivity up to model-shed work standards was needed in some of the medium-size and small sheds. Costs 0.5 cent higher than for model sheds were due to excess labor in 4 grading, 4 packing, and 1 transportation operation. Based on work standards used in deriving model-shed costs, (appendix table 15), an estimated 43 employees, including 17 graders and 14 packers in the 9 observed packing sheds, were not required. This would be enough employees to operate a small shed.

All but 2 of the 9 observed sheds had one or more shed operations with costs that could be reduced to within 0.5 cent of model-shed costs by using model-shed methods. The 19 operations included transportation to load, 3; packing pinks, 3; closing, 3; grading, packing U.S. No. 1 grade, packing U.S. No. 2 grade, and stacking, 2 each; weighing, 1; and container assembly and supply operation, 1.

IMPLICATIONS AND TRENDS

As was stated in the objectives, no attempt is made in this report to develop or suggest new methods or equipment. However, the findings do suggest some directions which the Lower Rio Grande Valley may proceed.

Table 12.---Labor and equipment costs per 40-pound equivalent comparing methods of model and observed tomato packing sheds, Lower Rio Grande Valley, Tex., 1962 1/

Shed operation	Shed size											
	Small			Medium			Large					
	:Model :	1 :	2 :	3 :	4 :	5 :	6 :	Model :	7 :	8 :	9 :	
	:Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Weigh, unload, and dump, return :												
empty containers to truck.....:	2.25	2.95	2.53	2.96	3.18	1.58	1.93	2.30	1.40	2.16	1.71	1.49
Wash, dry, grade, and size.....:	7.03	7.03	7.14	7.14	7.03	5.92	6.22	5.92	6.02	6.02	6.95	9.55.
Pack U.S. No. 1 grade, U.S. :												
No. 2 grade, and pinks.....:	2.94	3.34	3.34	16.86	5.76	2.26	2.48	2.20	2.13	14.18	2.14	3.07
Weigh and close packed :												
containers.....:	1.02	1.85	1.03	3.04	2.57	1.03	1.48	1.48	.98	1.43	1.48	1.16
Stack, transport to load, :												
and load.....:	2.25	3.66	2.76	3.75	4.34	1.54	1.86	2.13	1.47	2.24	1.88	1.45
Assemble and supply containers, :												
cull disposal.....:	3.53	3.91	3.56	6.92	3.91	3.00	2.98	3.04	2.79	3.14	2.79	3.14
Office equipment, field boxes, :												
mechanic.....:	2.24	2.24	2.24	2.24	2.24	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Total.....:	21.26	24.98	22.60	42.91	29.03	17.33	18.95	19.07	16.79	31.17	18.95	21.86

1/ Assumes methods used in observed packing sheds were used in model packing sheds, operating a 200-hour season under 1962 conditions.

Table 13.--A comparison of labor and equipment costs per 40-pound equivalent in model and observed tomato packing sheds, Lower Rio Grande Valley, Tex., 1962 1/

Shed operation	Shed Size													
	Small				Medium				Large					
	:Model	: 1	: 2	: 3	: 4	:Model	: 5	: 6	:Model	: 7	: 8	: 9		
	:Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Weighing incoming tomatoes.....	0.55	0.80	0.85	1.08	0.78	0.30	0.45	0.79	0.18	0.37	0.16	0.28		
Unloading from field trucks.....	.86	1.13	.82	.86	1.32	.47	.71	.99	.34	.95	.52	.35		
Dumping full field boxes.....	.84	.76	.80	.84	1.06	.58	.60	.93	.62	.83	.72	.62		
Returning empty field boxes.....	--	.39	--	.43	--	.23	.49	.58	.26	.50	.13	.27		
Washing.....	.19	.20	.22	.34	.15	.12	.10	.27	.14	.22	.10	.20		
Drying.....	.35	.37	.41	.63	.27	.20	.18	.48	.24	.39	.17	.36		
Grading.....	5.17	5.82	5.91	8.12	7.39	4.80	4.89	5.59	4.88	4.86	5.44	7.88		
Sizing.....	1.32	1.40	1.53	2.36	1.02	.80	.69	1.86	.76	1.22	.54	.75		
Packing U.S. No. 1 grade.....	1.77	2.04	2.93	14.87	2.57	1.41	1.69	1.90	1.33	11.63	1.20	1.51		
Packing U.S. No. 2 grade.....	.65	.98	1.80	1.99	3.53	.57	.83	.90	.47	4.36	.43	.63		
Packing pinks.....	.52	.48	.51	2.88	--	.28	.53	--	.33	1.54	.42	1.17		
Weighing.....	.62	.97	1.01	.48	1.39	.59	.61	1.26	.59	.58	.68	.61		
Closing.....	.40	.36	.76	3.36	1.28	.44	.71	.59	.39	1.52	.37	.63		
Stacking.....	.59	.75	.21	1.43	1.28	.54	.41	1.06	.57	.76	.46	.71		
Transportation to load.....	.85	1.78	1.32	1.06	1.40	.56	1.24	1.49	.38	1.26	.71	.52		
Loading.....	.81	.90	1.14	1.17	1.28	.44	.48	.90	.52	.94	.31	.41		
Container assembly and supply....	2.47	2.16	2.28	5.58	2.55	2.23	2.14	2.68	2.15	3.06	1.86	2.40		
Cull disposal.....	1.06	1.08	1.25	1.60	.95	.77	.58	1.23	.64	.98	.57	.70		
Office equipment.....	.46	.49	.54	.84	.36	.40	.34	.95	.36	.59	.25	.36		
Field boxes.....	1.38	1.47	1.62	2.53	1.05	1.38	1.17	3.29	1.38	2.25	.96	1.35		
Mechanic.....	.40	.36	.38	.39	.43	.22	.24	.30	.26	.31	.25	.27		
Total.....	:21.26	24.69	26.29	52.84	30.06	17.33	19.08	28.04	16.79	39.12	16.25	21.98		

1/ Equipment costs are based on replacement cost of new equipment.

From the 2 previous reports in the series on Lower Rio Grande Valley tomatoes, it was concluded that the market appears to behave in a highly competitive manner 13/ and the market apparently performs efficiently in adjusting margins for changes in costs due to changes in quality. 14/

Conclusions indicated in this report are that: (1) A medium-size packing operation handling 550 40-pound equivalents per hour over a 200-hour season compared with a small shed handling 300 units per hour, achieves savings of 8.4 cents per unit. A large operation (925 units per hour) achieves additional savings of 2.3 cents over the medium-size facility. (2) In a medium-size shed with above average output per packing-line worker, it costs 13 cents less per 40-pound equivalent to pack tomatoes of 60 percent than 40 percent U.S. No. 1 grade. The comparable difference for a medium-size shed with below average output per packing-line worker is 30 cents. (3) The 40-pound carton commanded a premium in 1961 above the additional cost of the container. The premium over WBC is estimated to be 1 cent for size 6x6 and 9 cents for size 6x7 tomatoes. (4) Costs per 40-pound equivalent are estimated at \$1 in a large packing operation running 100 hours per season, 81 cents for a 200-hour season, and 74 cents if fixed costs are spread over a 300-hour season. (5) There are several methods that can be used for any one shed operation and the most automatic, least labor combination may not be the least cost method. Thus, in order to realize least costs, a large shed operating an average season of less than 149 hours should dump tomatoes manually, rather than use an automatic dumper. (6) Present sheds can realize cost savings by adopting methods of operation already in use in some sheds. The cost per 40-pound unit of weighing and closing packed boxes is 1 cent in the medium-size model shed using 1 weighing and 1 closing station. If 2 weighing and 2 closing stations are used, the cost per unit increases to 1.5 cents.

Assuming no extreme change in green tomato acreage in the Lower Rio Grande Valley, several trends are indicated from the foregoing conclusions.

1. The 40-pound fiberboard or similar container that can be jumble-packed will be dominant in the future (see table 8).

2. In a competitive and efficient market, individual shippers will continue to have little influence on tomato prices. Prices paid growers will continue to be the result of f.o.b. prices minus packing costs.

3. Economies of scale in packing tomatoes will gradually reduce the number of shippers handling tomatoes and those who remain or enter the market are apt to be medium or large in size.

4. In an effort to increase their volume and extend the operating hours during the season, sheds may emphasize vertical integration or control over production by means of contracts, limited or extensive financing of production, or ownership of acreage. This competition for more volume and a longer season will continue to exert a downward pressure on unit costs.

5. Unless the tomato deal can be extended greatly, automatic equipment probably will not be used as widely in the Lower Valley as in other packing areas such as Florida. However, the higher minimum wage effective in the fall of 1963 will hasten the trend toward more automation and toward medium-size or large packing sheds.

13/ Podany and Farrish (see footnote 10).

14/ Bohall, Podany, and Farrish (see footnote 8).

6. Competition will gradually force out inefficient methods of operation. An example is the transition from hand-packing the tomatoes in lugs, to jumble-packing them in cartons across the old lug bins, to jumble-packing them in cartons directly off crossbelts from sizers.

APPENDIX I

Table 14.--Packing mature green tomatoes: Estimated equipment costs, use life, and horsepower requirements, Lower Rio Grande Valley, Tex., May-June 1962

Equipment	Estimated replacement cost <u>1/</u>	Use life:	Motors <u>2/</u>	Variable cost per hour <u>3/</u>	Fixed cost per year <u>4/</u>	Total equipment cost for 200-hour packing season
	Dollars	Years	Horsepower	Cents	Dollars	Dollars
Dump hopper:						
36".....	140	15	--	.70	19.13	20.53
48".....	190	15	--	.95	25.97	27.87
Automatic dump, pineapple: type.....	5,000	15	4	37.00	683.35	757.35
Washer:						
36".....	770	15	1/2	5.35	105.24	115.94
48".....	850	15	1/2	5.75	116.17	127.67
Dryer:						
36".....	1,400	15	3/4	9.25	191.34	209.84
48".....	1,500	15	3/4	9.75	205.00	224.50
Grading table:						
36" x 8'.....	700	15	1/2	5.00	95.67	105.67
36" x 11'.....	900	15	3/4	6.75	123.00	136.50
48" x 11'.....	1,240	15	1	9.20	169.47	187.87
48" x 15'.....	1,350	15	1	9.75	184.50	204.00
48" x 16'.....	1,440	15	1 1/2	11.70	196.80	220.20
48" x 18'.....	1,540	15	1 1/2	12.20	210.47	234.87
Sizer:						
4-belt 24".....	1,870	15	3/4	11.60	255.57	278.77
4-belt 36".....	2,070	15	3/4	12.60	282.91	308.11
4-belt 48".....	2,270	15	3/4	13.60	310.24	337.44
5-belt 36".....	2,470	15	3/4	14.60	337.57	366.77
5-belt 48".....	2,670	15	1	16.35	364.91	397.61
Elevator:						
24" x 5'.....	450	15	1/3	3.25	61.50	68.00
36" x 5'.....	550	15	1/3	3.75	75.17	82.67
Elevator-grading table:						
24" x 4'.....	590	15	1/3	3.95	80.64	88.54
36" x 4'.....	650	15	1/3	4.25	88.84	97.34
Cross belt and conveyer:						
12" x 5'.....	350	12	1/3	2.75	53.67	59.17
12" x 8'.....	400	12	1/3	3.00	61.33	67.33
12" x 11'.....	440	12	1/3	3.20	67.47	73.87
12" x 12'.....	450	12	1/3	3.25	69.00	75.50
12" x 15'.....	490	12	1/3	3.45	75.13	82.03
12" x 20'.....	570	12	1/2	3.35	87.39	94.09
12" x 45'.....	950	12	1	7.75	145.66	161.16
12" x 56'.....	1,060	12	1	8.30	162.53	179.13
16" x 4' <u>5/</u>	400	12	1/3	3.00	61.33	67.33
16" x 11'.....	500	12	1/3	3.50	76.66	83.66
16" x 12'.....	520	12	1/3	3.60	79.73	86.93
16" x 15'.....	580	12	1/2	4.40	88.93	97.73
16" x 16'.....	600	12	1/2	4.50	92.00	101.00
16" x 18'.....	630	12	1/2	4.65	96.60	105.90
16" x 20'.....	660	12	1/2	4.80	101.20	110.80
16" x 26'.....	790	12	3/4	6.20	121.13	133.53
16" x 30'.....	860	12	3/4	6.55	131.86	144.96
16" x 34'.....	1,040	12	3/4	7.45	159.46	174.36
4 belts 16" x 4' <u>5/</u>	875	12	3/4	6.62	134.16	147.40

See footnotes at end of table.

Table 14.--Packing mature green tomatoes: Estimated equipment cost, use life, and horsepower requirements, Lower Rio Grande Valley, Tex., May-June, 1962--Continued

Equipment	Estimated replacement cost <u>1/</u>	Use life	Motors <u>2/</u>	Variable cost per hour <u>3/</u>	Fixed cost per year <u>4/</u>	Total equipment cost for 200- hour packing season
	Dollars	Years	Horsepower	Cents	Dollars	Dollars
Extendable power conveyor:	1,000	15	1/2	6.50	136.67	149.67
Distributing belt:						
36" x 14'.....	830	12	3/4	6.40	127.26	140.06
36" x 16'.....	930	12	1	7.65	142.60	157.90
36" x 24'.....	1,210	12	1 1/2	10.55	185.53	206.63
36" x 30'.....	1,450	12	1 1/2	11.75	222.33	245.83
36" x 40'.....	1,920	12	2	15.60	294.39	325.59
Packed box conveyor: <u>6/</u>						
20'.....	500	12	1/2	4.00	76.66	84.66
25'.....	570	12	3/4	5.10	87.40	97.60
27'.....	600	12	3/4	5.25	92.00	102.50
30'.....	650	12	3/4	5.50	99.66	110.66
40'.....	800	12	1	7.00	122.66	136.66
50'.....	920	12	1	7.60	141.06	156.26
55'.....	980	12	1	7.90	150.26	166.06
80'.....	1,340	12	1 1/2	11.20	205.46	227.86
90° power turn.....	275	15	1/2	2.88	37.58	43.34
Roller conveyor:						
10'.....	40	15	--	.20	5.47	5.87
90° turn.....	90	15	--	.45	12.30	13.20
Box conveyor:						
30'.....	200	12	--	1.00	30.67	32.67
25' with turn.....	230	12	--	1.15	35.27	37.57
Scales:						
Light.....	200	15	--	1.00	27.33	29.33
Light duty truck.....	500	15	--	2.50	68.34	73.34
Packing line.....	100	15	--	.50	13.67	14.67
Trip scale.....	100	15	--	.50	13.67	14.67
In-plant transportation:						
Handtrucks.....	100	15	--	.50	13.67	14.67
Forklift trucks <u>7/</u>	1,150	10	--	43.00	195.50	281.50
Pallets per 100.....	225	10	--	1.12	38.25	40.49
Cull bin:						
6'x 6'x 5'.....	180	15	--	.90	24.60	26.40
6'x 6'x 9'.....	325	15	--	1.62	44.42	47.66
7'x 8'x 10 1/2'.....	590	15	--	2.95	80.64	86.54
Field boxes per 1,000.....	1,300	5	--	6.50	351.00	364.00
Office equipment per \$100.....	100	12	--	.50	15.33	16.33
Field box chute 10'.....	50	15	--	.25	6.83	7.33

1/ Including installation and motors.

2/ Roughly 1 motor hp. for every 100 square feet of movement, assuming motors deliver 2/3 of hp. ratings.

3/ 3 cents per motor horsepower per hour plus 0.005 percent of replacement costs per hour.

4/ Annual fixed costs as a percentage of replacement costs are interest 3.5 percent, repairs 1.5 percent, taxes 1 percent, insurance 1 percent, and depreciation based on the straight-line method of equal increments over the use life of equipment.

5/ With packing chutes.

6/ 15" rollers, 12" belt.

7/ Assumes 25 percent of fixed cost chargeable to tomatoes. Variable cost based on total replacement costs (\$4,600) plus 20 cents per hour for gasoline.

Table 15.--Packing mature green tomatoes: Labor standards, Lower Rio Grande Valley, Tex., May-June 1962

Shed operations and method	Type of observation <u>1</u> /	Unit	Labor standard
			<u>Units Per Man-Hour</u>
Weighing incoming tomatoes--all methods.....	AP	48-pound field boxes	2/876
Unloading from field truck:			
Manually onto an extendable power conveyer:	AP	do.	444
Manually to end of truck, set in stack....	AP	do.	184
Handtruck from truck to dump station 20'...	TS	do.	280
Handtruck from truck to dump station and return with empty containers 20'.....	TS	do.	155
Dumping full field boxes:			
Automatic dumper.....	AP	do.	2/876
Manually lift from stack, dump onto a moving belt.....	WS	do.	276
Manually lift from stack, dump into dump hopper.....	WS	do.	198
Manually set on power conveyer from stack, dump onto a moving belt.....	WS	do.	245
Dump onto a moving belt.....	AP	do.	450
Returning empty field boxes:			
Stack and pile boxes.....	AP	do.	436
Handtruck empties only, 20'.....	TS	do.	1,008
Grading:			
2 grading tables per line.....	WS	40-pound equivalents	29.2
2 grading tables per line and culls from No. 2's.....	WS	do.	28.3
3 grading tables per line.....	WS	do.	24.5
Packing U.S. No. 1 grade:			
Cartons--Jumble-fill from crossbelts.....	WS	do.	97.8
Cartons--Jumble-fill manually.....	WS	do.	38.5
Lugs--hand-wrap and place-pack.....	WS	30-pound equivalents	16.3
Packing U.S. No. 2 grade:			
Cartons--jumble-fill from crossbelts.....	WS	40-pound equivalents	47.6
WBC--jumble-fill from crossbelts.....	WS	60-pound equivalents	37.6
Lugs--hand-wrap and place-pack.....	WS	30-pound equivalents	17.2
Packing pinks:			
Cartons or WBC--jumble-fill from crossbelts.....	WS	40-pound equivalent	44.4
Lugs or flats--hand-wrap and place-pack...	WS	30-pound equivalent	19.1
Weighing:			
1 weighing station--all tomatoes.....	WS	40-pound equivalent	327
2 weighing stations--U.S. No. 1 grade station, U.S. No. 2 grade station.....	WS	do.	279
U.S. No. 2 grade station.....	WS	do.	265
Weigh on the packing line.....	WS	do.	263
Closing:			
1 closing station all tomatoes--cartons or WBC.....	WS	do.	356
2 closing stations--main closing station, secondary closing station.....	WS	do.	333
Stacking:			
1 stacking station all tomatoes--cartons or WBC.....	WS	do.	310
See footnotes at end of table.			

Table 15.--Packing mature green tomatoes: Labor standards, Lower Rio Grande Valley, Tex., May-June 1962--Continued

Shed operations and method	Type of observation ^{1/}	Unit	Labor standard
			<u>Units per man-hour</u>
2 stacking stations--main stacking station;	WS	do.	468
secondary stacking station.....	WS	do.	404
Transportation to load:			
Forklift truck 30'.....	AP	do.	<u>2/</u> 925
Handtruck 20'.....	TS	do.	265
Roller conveyers 30', 3 points of distri-			
bution.....	TS, WS, AP	do.	140
Loading:			
Cartons in truck or railcar--1 man.....	TS	do.	270
Cartons in truck or railcar--2-man crews..	TS	do.	183
Container assembly including getting ma-			
terials:			
Make bottom and insides of cartons.....	TS	do.	131
Make tops of cartons.....	TS	do.	228
Supply to packers or stack.....	TS	do.	397
Assemble WBC.....	TS	60-pound equivalent	106
Cull disposal:			
Pack and weigh.....	WS	CWT.	31
Handtruck (see unloading field boxes).....			

^{1/} AP = Actual Performance, WS = Work Sampling, and TS = Time Study.

^{2/} Or more.

Table 16.---Model packing shed, medium size: Quality-and nonquality-associated costs for a 200-hour season, by quality and level of output per packing-line worker, Lower Rio Grande Valley, Tex., 1962

Item	Unit	Quality level (percent U.S. No. 1 grade)										
		90%	80%	70%	66%	60%	50%	40%	30%	20%		
Percentage packout <u>1/</u>	Percent	96.5	93.0	89.5	88.1	86.0	82.5	79.0	75.5	72.0		
Total packout:												
Below average output.....	40-pound equivalent											
Average output.....	do.	124,440	109,310	94,520	88,575	79,560	64,770	49,640	34,850	19,890		
Above average output.....	do.	134,300	119,340	104,550	98,595	89,420	74,630	59,670	44,880	29,750		
Quality-associated costs:												
Cull disposal:												
Below average output.....	Dollar	108	197	266	287	311	330	317	271	186		
Average output.....	do.	117	216	294	319	349	380	381	350	278		
Above average output.....	do.	138	259	362	397	444	502	534	536	503		
Other <u>2/</u>	do.	39,836	39,836	39,836	39,836	39,836	39,836	39,836	39,836	39,836		
Nonquality-associated costs: <u>3/</u>												
Below average output.....	do.	57,964	50,917	44,027	41,258	37,059	30,170	23,122	16,233	9,265		
Average output.....	do.	62,557	55,589	48,699	45,926	41,652	34,763	27,794	20,905	13,858		
Above average output.....	do.	73,722	66,754	59,865	57,091	52,896	45,928	38,960	32,070	25,102		
Total costs:												
Below average output.....	do.	97,908	90,950	84,129	81,381	77,206	70,336	63,275	56,340	49,287		
Average output.....	do.	102,510	95,641	88,829	86,081	81,837	74,979	68,011	61,091	53,972		
Above average output.....	do.	113,696	106,849	100,063	97,324	93,176	86,266	79,330	72,442	65,441		
Total costs per 40-pound equiv.:												
Below average output.....	Cent	78.68	83.20	89.00	91.88	97.04	108.59	127.47	161.66	247.80		
Average output.....	do.	76.33	80.14	84.96	87.31	91.52	100.47	113.98	136.12	181.42		
Above average output.....	do.	71.83	74.56	77.86	79.41	82.05	87.49	94.85	105.22	121.43		
Total costs per pound: <u>4/</u>												
Below average output.....	do.	1.97	2.08	2.22	2.30	2.43	2.71	3.19	4.04	6.20		
Average output.....	do.	1.91	2.00	2.12	2.18	2.29	2.51	2.85	3.40	4.54		
Above average output.....	do.	1.80	1.86	1.95	1.99	2.05	2.19	2.37	2.63	3.04		
Change in total costs per pound:												
from 60 percent U.S. No. 1												
grade:												
Below average output.....	do.	-.46	-.35	-.21	-.13	00	.28	.76	1.61	3.76		
Average output.....	do.	-.38	-.29	-.17	-.11	00	.22	.56	1.11	2.25		
Above average output.....	do.	-.25	-.19	-.10	-.07	00	.14	.32	.58	.99		

1/ Percent culls is equal to the percent packout subtracted from 100 percent.
2/ Total plant labor cost \$12,826, equipment \$5,634, buildings \$3,243, salaried labor and overhead \$18,133.
3/ 46.58 cents per 40-pound equivalent.
4/ Total costs per 40-pound equivalent divided by 40 pounds. Figures may not always check out due to rounding.

Table 17.--Model packing sheds: Fixed, variable, and per unit costs of packing for 100-, 200-, and 300-hour seasons, Lower Rio Grande Valley, Tex., 1962

Item	Length of packing season											
	100 hours				200 hours				300 hours			
	Fixed	Variable	Per 40- pound equivalent	Fixed	Variable	Per 40- pound equivalent	Fixed	Variable	Per 40- pound equivalent	Fixed	Variable	Per 40- pound equivalent
	Dollars	Dollars	Cents	Dollars	Dollars	Cents	Dollars	Dollars	Cents	Dollars	Dollars	Cents
Small model shed costs:												
Buildings.....	2,349.05	---	7.83	2,349.05	---	3.92	2,349.05	---	3.92	2,349.05	---	2.61
Equipment.....	3,565.97	142.24	12.36	3,565.97	284.48	6.41	3,565.97	426.72	6.41	3,565.97	426.72	4.44
Labor.....	---	4,356.00	14.52	---	8,712.00	14.52	---	13,068.00	14.52	---	13,068.00	14.52
Other costs.....	9,372.50	15,320.60	82.31	9,372.50	30,641.21	66.69	9,372.50	45,961.80	66.69	9,372.50	45,961.80	61.48
Total.....	15,287.52	19,818.84	117.02	15,287.52	39,637.69	91.54	15,287.52	59,456.52	91.54	15,287.52	59,456.52	83.05
Medium model shed costs:												
Buildings.....	3,242.63	---	5.90	3,242.63	---	2.95	3,242.63	---	2.95	3,242.63	---	1.97
Equipment.....	5,169.08	232.26	9.82	5,169.08	464.52	5.12	5,169.08	696.78	5.12	5,169.08	696.78	3.55
Labor.....	---	6,413.00	11.66	---	12,826.00	11.66	---	19,239.00	11.66	---	19,239.00	11.66
Other costs.....	14,347.50	27,689.62	76.43	14,347.50	55,379.26	63.39	14,347.50	83,068.85	63.39	14,347.50	83,068.85	59.04
Total.....	22,759.21	34,334.88	103.81	22,759.21	68,669.78	83.12	22,759.21	103,004.63	83.12	22,759.21	103,004.63	76.22
Large model shed costs:												
Buildings.....	3,954.69	---	4.27	3,954.69	---	2.14	3,954.69	---	2.14	3,954.69	---	1.42
Equipment.....	9,099.10	396.05	10.27	9,099.10	792.10	5.35	9,099.10	1,188.15	5.35	9,099.10	1,188.15	3.71
Labor.....	---	10,164.00	10.99	---	20,328.00	10.99	---	30,492.00	10.99	---	30,492.00	10.99
Other costs.....	22,667.50	46,354.02	74.62	22,667.50	92,708.05	62.36	22,667.50	139,062.09	62.36	22,667.50	139,062.09	58.28
Total.....	35,721.29	56,914.07	100.15	35,721.29	113,828.15	80.84	35,721.29	170,742.24	80.84	35,721.29	170,742.24	74.40

APPENDIX II

Building Costs of Model Sheds

Average replacement costs for model sheds of small, medium, and large capacity are derived from information supplied by several builders in the Valley. The type of packing-shed construction varies from wood structures to concrete buildings or a combination of concrete and brick. Concrete is considered necessary in sheds using forklift trucks, while wood floors may be adequate for handtruck, in-plant transportation.

In considering the yearly cost of buildings, the length of life is estimated to be 40 years for concrete buildings and 33 for wood sheds. Insurance rates for concrete are less than half than for wood sheds, and repairs are 0.2 percent higher in the wood sheds. Taxes and interest are applied at the same rate for both types of structures.

The initial investment in a wood shed is less than in a concrete or concrete and brick building. The difference between concrete and wood construction in the annual fixed cost of insurance and depreciation makes concrete less expensive in the long run. Concrete also is adequate for either handtruck or forklift, in-shed transportation. For a shed of 7,000 square feet, the annual fixed cost of a concrete shed with metal or wire siding is estimated at 46 cents per square foot, compared with 48 cents for a wood shed (table 18).

The least cost combination for either concrete or wood construction is a shed with open sides. However, limited security is provided by metal or wire siding. The additional annual cost of metal or wire siding in the large model shed is less than \$208. The expense of hiring a night watchman during the packing season alone would probably exceed this. Thus, in a sense the shed with wire or metal siding does represent the least cost setup.

Other Costs

Costs Constant with Each Unit of Packout

Container Costs

The price of unassembled containers in 1962 was generally 38 cents for the 40-pound fiberboard carton and 52 cents for the wirebound crate. Minor variations of 0.5 to 1 cent per container were also reported. The cost of the 30-pound lug was estimated at 51 cents, which includes the cost of nails, labels, paste, car strips, and wraps for the tomatoes.

Marketing Order Committee

Lower Rio Grande Valley tomatoes are marketed under a Federal Marketing Order. To meet necessary expenses, an assessment is levied by the Texas Valley Tomato Committee on shipments out of the area. In 1962, the fee was 1 cent per 60-pound equivalent of tomatoes or 0.66 cent per 40-pound equivalent.

Inspection Service

A requirement of the marketing order is Federal-State inspection of all shipments of mature green tomatoes leaving the Lower Valley. The State of Texas sets the rates

Table 18.--Replacement and annual fixed costs per square foot for various sizes and types of tomato packing sheds, Lower Rio Grande Valley, Tex., 1962

Type of construction of shed 1/ 2/	Use life	Annual fixed cost as a percentage of replacement cost 2/	Replacement cost per square foot for shed of--				Annual fixed cost per square foot for shed of--			
			Dollars		Dollars		Dollars		Dollars	
	Years	Percent	4,000		7,000		10,000		13,000	
			sq. ft.:		sq. ft.:		sq. ft.:		sq. ft.:	
Concrete floor:			Dollars		Dollars		Dollars		Dollars	
Open sides.....	40	9.4	5.22		4.68		4.32		4.20	
Metal or wire siding....	40	9.4	5.52		4.90		4.52		4.37	
Brick walls.....	40	9.4	6.23		5.50		5.06		4.89	
Wood floor:			Dollars		Dollars		Dollars		Dollars	
Metal or wire siding....	33	11.0	4.95		4.38		4.00		3.87	
Open sides.....	33	11.0	4.65		4.17		3.82		3.71	

1/ Truck-bed height, wood frame roof with 12-foot-clear height, 30- to 40-foot roof spans.

2/ Annual cost as a percentage of total replacement costs are as follows:

	Concrete floor (percent)	Wooden floor (percent)
Depreciation.....	2.5	3.0
Insurance.....	.6	1.5
Repairs.....	1.8	2.0
Taxes.....	1.0	1.0
Interest.....	3.5	3.5

which in 1962 were 2.5 cents per 40-pound carton, 2 cents per 30-pound lug, and 3.5 cents per 60-pound wirebound crate.

Telephone and Telegraph

Telephone and telegraph costs incurred in selling vary depending on the strength of the tomato shipping-point market. A shipper operating in a strong market will be contacted by prospective buyers, but as the market weakens the situation reverses, and the shipper will telephone or telegraph prospective buyers. The telephone and telegraph cost of selling tomatoes in 1962 in the Lower Valley averaged \$10 per 30,000-pound carlot equivalent. This is 2 cents per 60-pound wirebound equivalent or 1.33 cents per 40-pound carton.

Office Supplies

The variable cost of office supplies is estimated at 0.15 cent per 40-pound carton.

Waxing

After tomatoes are washed and dried, they are run through a waxer which gives them a thin protective wax coat and a glossy shine. The wax applicator is usually leased by shippers from local equipment dealers for around 2.5 cents per 60-pound equivalent, which covers the cost of the equipment plus royalties. Wax costs \$4 per gallon, which is enough for 60,000 pounds of tomatoes. The total cost of wax and applicator is assumed to be 3 cents per 60 pounds or 2 cents for 40 pounds in the model plants.

Chlorine Sterilization

To prevent decay in shipment, chlorine is used in the washing process. The equipment and chemicals used in this sterilization process are leased by Lower Valley shippers. Rates are graduated to give volume users slightly reduced costs. In the model sheds, an average price per carlot of \$14.90 for the small, \$14.45 for the medium-size, and \$13.70 for the large shed, is used.

Costs Constant with Each Hour the Shed Operates

Electrical Power for Office and Shed

Electrical power requirements for model sheds are estimated on the basis of shed size and average use of lights. The estimated office and shed lighting requirement is 10 watts per square foot of floor space. Shed lights are assumed to be in use 50 percent of the time and office lights, full time. In a model shed operating a 200-hour season the office is assumed to be in use 320 hours.

The rate schedule for electrical service in the Lower Valley in 1962 was used in computing the cost per kilowatt hour (3 cents) of electrical power in model sheds. On a 40-pound equivalent basis, the large shed has the lowest cost, 0.18 cent, compared with 0.24 cent in the medium-size shed and 0.3 cent in the large.

Other Utilities

Other utilities include gas, water, and sewage disposal. Sewage disposal does not include the disposal of cull fruit. Based on limited information obtained from the selected sheds, the cost of other utilities per hour of operation is estimated to be 40 cents for the small shed, 70 cents for the medium-size, and \$1.10 for the large shed.

Overtime Inspection

Overtime rates of an extra \$2 per hour are charged for inspection service between 9 p.m. and 6 a.m. It is estimated that in model sheds overtime inspection costs are incurred 25 percent of the time. Therefore, the expense for a 200-hour season would be \$100 per model shed regardless of size.

Interest on Capital Requirements and Bank Service

Average capital requirements for the model sheds are assumed to be large enough to purchase 25 percent of the tomatoes at 4 cents per pound (culls out), pay the wages of hourly labor for 50 hours, and pay 25 percent of the wage of salaried employees. Interest and bank service is estimated as 6 percent per year for 3 months on the average capital requirements. The cost of bank service and capital for a 200-hour operating season is \$426 for the small model shed, \$758 for the medium-size shed, and \$1,262 for the large.

Automobile Expense

Mileage for employees using private autos is an expense of coordinating field operations with those of the shed. In tabulating other costs, mileage expense is included as an hourly expense of \$8 for the small, \$12 for the medium-size shed, and \$20 for the large shed.

Cost Constant with the Amount of Culls

Cull Disposal

Cull disposal expense covers costs of the labor and equipment required to take nonsalable tomatoes from the tomato shed to disposal areas. Considerable variation was observed in the methods used to dispose of culls, and this was considered in selecting the least cost alternative for model sheds. For the model sheds, cull-disposal costs are estimated to be 6 cents per 100 pounds of culls.

Annual Fixed Costs

Salaried Labor

The observed plants varied considerably in the number of employees in administrative, clerical, sales, and fieldmen positions, and in their salaries. These employees are usually hired for the tomato season. Hence, their salaries are considered a fixed cost. In the models, a small part of this expense is included as an hourly cost. This is the labor incentive or extra wages for a few hourly employees such as head graders, mechanics, and other workers acting as foremen or performing difficult work. Table 19 shows the salary, wage rate, and number of salaried workers thought necessary for the model sheds, including the labor incentive.

The cost of salaried labor for the large model shed is more than double that of the small shed or \$19,320, compared with \$8,540 for the small shed. However, on a 40-pound equivalent basis, costs are 14.2 cents in the small shed, 11.5 cents in the medium-size, and 10.4 cents in the large model shed.

Table 19.--Model packing sheds: Salaried labor, number of employees, and total cost for a 200-hour operating season, Lower Rio Grande Valley, Tex., 1962

Position or job	Employees			Length of		Salary		Total cost for 200-hour operating season		
	Medium-size		Large	shed	employment	:	:	Medium-size		Large
	Small	shed						Small	shed	
	Number	Number	Number					Dollars	Dollars	Dollars
Manager.....	1	1	1	4 months	550 month			2,200	2,200	2,200
Assistant manager.....	--	1	1	4 months	550 month			--	2,200	2,200
Sales manager.....	--	--	1	4 months	550 month			--	--	2,200
Assistant sales manager.....	1	1	1	8 weeks	125 week			1,000	1,000	1,000
Shed foremen.....	1	1	2	10 weeks	150 week			1,500	1,500	3,000
Fieldmen.....	2	3	5	8 weeks	125 week			2,000	3,000	5,000
Office and clerical workers.....	2	3	4	8 weeks	110 week			1,760	2,640	3,520
Labor incentive.....	--	--	--	200 hours	1/ hour			80	120	200
Total.....	--	--	--	---	---			8,540	12,660	19,320
Cost per 40-pound equivalent.....	--	--	--	---	---			Cents 14.23	Cents 11.51	Cents 10.44

1/ \$0.40 per hour in small shed, \$0.60 in medium-size, \$1 in large shed.

Insurance

Insurance costs cover bonding of employees, liability insurance, and insurance against payroll robbery. Insurance cost for the model sheds is estimated at \$2.50 per average employee, including both hourly and salaried workers. The small model shed has 43 employees, the medium 63, and the large 99. The total cost of insurance is \$107.50, \$157.50, and \$247.50 for the small, medium-size, and large model sheds.

Telephone and Telegraph

In addition to a variable cost per unit of packout, there is a basic charge for telephone service locally. The expense of 2 months local service is charged to the tomato operation for the model sheds. The service per month, using local rates, costs an estimated \$30 per month in the small model shed, \$50 in the medium-size, and \$75 in the large shed.

Office Supplies

Annual fixed office supplies are estimated to cost \$50 per shed. This expense covers numerous miscellaneous small supplies, such as stamps.

Legal and Audit

This fee covers bookkeeping services and lawyers fees. Limited observations indicate considerable variation in this expense. For the model sheds, the estimate is an annual expense of \$500 for the small shed, \$1,000 for the medium-size, and \$2,000 for the large model shed.

Advertising

Based on observations in selected sheds, the advertising expense is estimated at \$100 for the medium-size shed and \$200 for the large model shed. No charge is made for the small shed.

Miscellaneous Expenses

Dues and subscriptions are estimated to average \$100 for the small shed, \$200 for the medium-size, and \$400 for the large model shed. Charitable donations for the small shed are around \$100, for the medium-size shed \$200, and for the large model shed \$500.

U.S. Department of Agriculture
Washington, D. C. 20250

Postage and Fees Paid
U.S. Department of Agriculture

OFFICIAL BUSINESS

